SECTION 6

TRAFFIC SIGNALS, SIGNS, AND STRIPING

6-1 TRAFFIC SIGNAL NEEDS ASSESSMENT – The need for new traffic signals shall be based on warrants contained in the latest edition of the California Manual on Uniform Traffic Control Devices (CMUTCD). For a more detailed description of a traffic signal needs assessment, refer to Section 4-2H of these Design Standards.

6-2 DESIGN STANDARDS - Traffic signals, striping, and signage shall be designed and constructed in accordance with these Design Standards and the latest editions (English units) of the following listed in order of precedence:

* City of Roseville Standard Notes as published on the City's Web site at: www.roseville.ca.us/ds/engineering.

* City of Roseville Design & Construction Standards.

* Caltrans Standard Specifications and Caltrans State Standard Plans, including all standard symbols contained therein.

* California Manual on Uniform Traffic Control Devices (CMUTCD).

* Attention is directed to the following from the CMUTCD:

  1. Table 4D-101. Suggested Detector Setbacks from Limitline.

  2. Tables 4D-108 and 4D-109 for conduit sizing. The 26% fill limit shall apply to new installations.

* A copy of the Traffic Signal Inspection Check list is included on Detail TS-22 as a reference of required inspections during construction.

A. Signal Standard Types – Traffic signal standards, posts, and mast arms shall be of the types listed in Table 6-1:

TABLE 6-1

STANDARD/POST	MAST ARM	LUMINAIRE ARM
Ped. Push Button	None	None
7 to 15 foot 1-B	None	None
Type 15	None	6-15 foot
Type 15 TS (7.2' foundation)	None	6-15 foot
16-2-100	20 foot	None
17-3-100	20 foot	6-15 foot
18-4-100	25-30 foot	None
19-4-100	25-30 foot	6-15 foot
23-4-100	35 foot	None
24-4-100	35 foot	6-15 foot
26-4-100	40-45 foot	6-15 foot
27-4-100	40-45 foot	None
28-5-100	50-55 foot	None
29-5-100	50-55 foot	6-15 foot
60-5-100	60-65 foot	None
61-5-100	60-65 foot	6-15 foot

The typical luminaire arm length used is 15 feet. Signal mast arms and luminaire mast arms shall be within 2 degrees of perpendicular to the centerline of the roadway. Type 15TS pole above shall be used in conjunction with IISNS installations.

1B poles for four section and five section heads shall be 13 feet and 14 feet tall respectively.

Poles (except 1-B's) shall be permanently labeled with the pole size, manufacturer, and serial number below or above the hand hole.

Signal pole and arm welding shall be performed by individuals certified by the pole manufacturer and shall not limit the original manufacturer warranty.

Foundation locations must be verified by Engineering prior to installation.

B. Vehicle and Pedestrian Signal Types – Vehicle signals and pedestrian signals shall be of the following types:

MAT (3 section only)
MAS
MAS-4C (split phase operation)
SV-1-T

SV-2-TB
SV-3-TB
TV-1-T
TV-2-T
TV-3-T
SP-1-CS
SP-2-CS

The MAT mounting shall only be used for 3 section vehicle signals for protected left turn movements. All other mast arm mounted vehicle signals shall be MAS mounted.

All signal faces shall be aluminum. Mountings for MAT and MAS signal sections shall be bronze metal.

Signal faces shall have 12-inch LED displays, unless otherwise specified.

All signal sections shall be 12-inch mold-cast aluminum with aluminum, perforated louver backplates.

Pedestrian heads shall be mounted on the intersection side of the signal pole unless otherwise directed by the Engineer and shall be clam shell type with bronze mounting hardware.

Protected left turn signals shall be all arrow.

Programmed visibility vehicle signals shall not be used without prior approval of City engineering staff and shall not be constructed of plastic.

Any 1B standard having a signal head display, 4 sections or larger, shall be installed under the following criteria:

1. Four (4) section displays will be side (SV-1-T or SV-2-T) mounted. The 1B standard shall be 13 feet in height. A PVC cap shall be provided as a pole cap.

2. Five (5) section display shall be side (SV-1-T or SV-2-T) mounted. The 1B standard shall be 14 feet in height. A PVC cap shall be provided as a pole cap.

3. The extra support method shall consist of a 1” stand off w/ ¼” X 20 threaded hole. The stand-off shall be banded to the signal standard, 3” below the bottom of the top slip fitting of the displays’ 1 ½ inch riser. A ¼ inch hole shall be drilled in the center of the 1 ½ inch riser to match the position of the thread hole on the stand-off. The riser shall be attached to the standoff with a ¼” X 20 bolt, which shall include a lock washer and flat washer.

C. Vehicle Signal Alignment – The following vehicle signal alignments are typical. Variations may be required on a case by case basis.

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 line between the two left turn lanes as close as possible.

3. Through movement signal indications shall align as follows:

   - 1 travel lane – the center of the lane.
   - 2 travel lanes, the lane line in-between the two lanes
   - 3 or more travel lanes – one signal indication shall be provided on each lane line between through lanes.

4. For one through lane with permissive left turn, the MAS signal shall line up as close as possible with the center of the through lane. Far left permissive signal indication shall not be used.

5. When a 4 section MAS (MAS-4C) signal is used, it shall line up with:

   - The lane line between the through and the left turn, or
   - The lane line between dual left turn lanes at a "T" intersection, or
   - The center of a single left turn lane at a "T" intersection, or
   - The center of a split phase shared through/left turn lane at a "T" intersection.

D. Number of Vehicle Signal Indications – Typical indications are as follows:

1. For protected left turn movements: one 3-section all arrow MAT and one 3-section all arrow far left side pole-mounted signal.

2. 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 or top pole-mounted signal.

3. For through movements (with permissive 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. Far left permissive signal indications shall not be used.

4. For split phased situations: one 4-section MAS (MAS-4C w/GA), one 3-section far left side pole-mounted signal, (all Arrow), one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal.

5. 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. Right turn arrow overlaps shall not be provided without prior approval of the City Engineer. Where right turn arrow overlaps are provided, the conflicting u-turn shall be prohibited via signage.

E. **Signal Phasing** - Signal phasing shall start with phase 2 northbound and proceed in a clock wise direction unless directed otherwise due to coordinated corridor restrictions.

F. **Permissive Left Turn Phasing** – Permissive left turn phasing shall only be considered under the following conditions:

1. Minor side street approach.

2. Single approach lane (excluding right turn lane).

3. Low vehicular (less than 45 cars over the peak hour) and pedestrian volumes.

4. The approach does not service a park or school.

5. The approach is not a main school pedestrian route.

Protected/Permissive phasing shall not be used in Roseville.

G. **Vehicle Detector Layout and Inputs** – Typical vehicle detector layout and inputs shall be as follows (see Details TS-9 and TS-10):

1. For permissive or protected left turn situations, the left turn lane shall have four loops with the first and second loops spaced 8 feet apart, the second and third loops spaced 9 feet apart, and the third and fourth loops spaced 10 feet apart. The fourth loop shall have counting ability. The other three loops can share one input.

2. Each through lane shall have two call loops spaced 8 feet apart with one count loop spaced 9 feet behind the second call loop and one advanced loop placed per the CMUTCD.

3. Each right turn only lane shall have one loop placed 30 feet behind the stop bar in line with the through lane count loops. The loop shall be used for counting and may be used for detection following a 10 second minimum delay.

4. For the stem of a "tee" intersection, each left turn lane shall have four loops with the first and second loops spaced 8 feet apart, the second and third loops spaced 9 feet apart, and the third and fourth loops spaced 10 feet apart. The fourth loop shall have counting ability. The other three loops can share one input. No intermediate or advanced loops will be required on "tee" stems.

5. For split phase signals with a shared through/left turn lane, the shared lane shall have four loops with the first and second loops spaced 8 feet apart, the second and third loops spaced 9 feet apart, and the third and fourth loops spaced 10 feet apart. The fourth loop shall have counting ability. There shall also be one advanced loop placed per the CMUTCD.

Front vehicle loops shall be Type D or a "Quadra Circle". Vehicle count and extension loops shall be Type A. The loops nearest the stop bar shall be placed 1 foot from the stop bar. Where a loop is designated to have counting ability as discussed above, the loop shall not share an input with any other loop. Loop wire shall terminate in the nearest pull box and not the hand hole.

Bicycle detection loops shall be Type D or a "Quadra Circle" except that their size shall be modified as follows:

- The loop size shall be decreased such that it is 1 foot narrower than the bike lane. A 6 foot bike lane shall have a 5 x5 foot loop, a 5 foot bike lane shall have a 4 x 4 foot loop, etc.
- The loop shall be centered in the lane.
- The center of the loop shall be 3 feet back of the crosswalk/stop bar.
- Each bicycle loop shall have its own detector lead-in cable and shall be spliced in the pull box not the handhole.
- Each loop shall consist of five turns of 14 AWG with XLLP insulation.

Detector lead-in cables shall be Type B and shall not be spliced between the termination point (pull box adjacent to detector loop) and the controller cabinet terminals. Tinned copper shall not be permitted.

Type B detector handholes shall be provided. Handholes shall be placed so they line up with roadway stripes to minimize the frequency of vehicle tires driving over the handhole covers. A sufficient number of handholes shall be placed so that detector loop saw cuts shall not cross adjacent lanes of travel.

Signal loops installed in new pavement shall be placed in the lift of asphalt concrete (AC) immediately below the final lift. The new bottom lift of AC shall be a minimum of 0.2' thick where the traffic signal loops

will be installed. New loops that will be buried under AC shall be installed in a 1¾" slot in the bottom lift. Loops installed in existing pavement shall be surface cut per the State of California Standard Plans unless other wise directed by the Engineer.

Existing buried loops damaged by construction shall be reinstalled as if in new pavement per the above paragraph. The contractor shall grind 1½ inches of pavement from lane line to lane line and at least 1 foot outside the limits of work required to install the entire loop wire. The loops shall then be covered by an asphalt concrete overlay per City Standards. Should the AC thickness be insufficient to install the loops as specified above, the contractor shall complete any additional grinding, excavating, or paving necessary to install the loops.

Loop Home Run slots shall be double cut to accommodate the twisted pair (3-turns/foot), or as directed by the Engineer. Sealant for filling slots shall be Hot Melt Rubberized Asphaltic Sealant or equivalent as approved by the Engineer. All excess sealant shall be sqeegeed off after application.

Where the approved plans call for preformed detector loops, the following shall apply:

1. The conduit shall be sealed to prevent the entrance of water and the movement of wires within the conduit.

2. The loop wires from the performed loop to the adjacent pull box or hand hole shall be twisted together into a pair (at least two turns per foot) and encased in Schedule 40 or Schedule 80 PVC or polypropylene conduit (⅜ inches minimum diameter). The lead-in conduit shall be sealed to prevent the entrance of water at the pull box or hand hole end.

3. The performed loop and lead-in conduits shall be placed prior to pouring final concrete. The top of the conduit shall be between 2 and 3 inches below top of finished surface. Where the concrete is steel reinforced, the preformed loops may rest on the steel.

4. All detector loop shields shall not be grounded to the ground bus in the controller cabinet. 6" of the shield wire will be wound around the DLC'S then insulated with heat shrink tubing.

Adjacent loops on the same sensor unit channel shall be wound in opposite directions (refer to details TS-9 and TS-10 for further information). All loops shall be wound in a manner such that any adjacent loop will be wound in the opposite direction. The loop at the limit line, closest to the center median (lane 1), shall be wound in a clockwise direction. The next loop back in the same lane shall be wound in a counter-clockwise direction and so on. The loop detector in

lane 2 closest to the limit line, shall be wound in a counterclockwise direction.

Loop locations must be verified by Engineering prior to installation. The contractor shall give 48 hours notice prior to loop verification request date.

H. Traffic Signal Conductors – New traffic signal and SIC conductors shall be installed per the following guidelines:

1. New wire may be pulled through existing conduits without removing conductors if based on common conditions:

a. There are a maximum number of four, ninety degree by twenty-four inch radius bends in one conduit run between pull boxes or termination points, and

b. Conductors, conduit, number of bends and length of the pull are within reasonable limits (under 175 feet for signal wiring and under 400 feet for signal interconnect wiring), and

c. Ratio of the conduit (inside diameter) to the combined diameter of both the new and existing conductors or cables (outside diameter), otherwise known as conduit fill, does not exceed 40 percent.

2. All existing conductors shall be removed from conduits, the conduit proven, existing wires inspected, and the new wires added and re-pulled along with the wires previously removed if:

a. Items a and b under number 1 above are met but the ratio of the conduit (inside diameter) to the combined diameter of both the new and existing conductors or cables (outside diameter), otherwise known as conduit fill, is greater than 40 percent but less than or equal to 60 percent, or

b. Items a through c under number 1 above are met but jamming occurs.

3. New conduit shall be installed per City of Roseville Construction Standards if more than four ninety degree radii exist, the length of the pull exceeds Item #1b above, or the ration of the conduit (inside diameter) to the combined diameter of both the new and existing conductors or cables (outside diameter), other wise known as conduit fill, exceeds 60 percent.

4. The new wire shall be pulled as follows:

a. Conductors shall be pulled into conduits by hand

b. Only Polymer Based pulling compounds such as Aqua-Gel by Ideal or equivalent shall be used

c. Lubricants shall be forcefully injected into the conduit system

d. Only fiberglass fish tape or polyester measure tape may be used

It is assumed that all existing conductors and cables are undamaged unless inspected, documented, and reported to the inspector prior to the contractor starting that section of the work. Otherwise, any damage to City facilities shall be repaired by the contractor at the contractor's cost in conformance with City standards.

Conductor installation in new conduits shall be limited to 26 percent fill of the conduit maximum.

Two (2) Category 5e cables and two (2) IMSA-14-3/20-1-STR 600 Volt Power Cable Color Code 3/C (Belden PN 601195 or City approved equivalent) shall be installed to the top of designated poles with 10 feet of slack each wire at the top of the pole.

In order to reduce strain on the CAT5 cabling, all cables shall be adequately supported by feeding them through a Kellems grip which is attached to and suspended from the pole cap.

The hole drilled for the CAT5 cabling shall be drilled on the back side of the pole three feet from the top in order to minimize the camera view obstructed by the cable and shall be threaded for a straight ¾" strain relief cord connector. At least four feet of cable shall be pulled through and secured by the strain relief cord connector. The cables shall be looped together, adequately secured to the pole to prevent movement, and sealed on the ends to prevent moisture exposure.

All new and replacement traffic signal phase wiring shall be multiple circuit conductors. Unique color coding shall be provided for each wire within the cable. The number of wires per cable shall be the next common size up from that required to provide the necessary wires as specified on the plans.

At new and remodeled traffic signals, a two inch, two cell "MAX CELL" or equivalent product shall be provided in all street crossing traffic signal conduits.

Equipment grounding conductors shall be # 6 stranded copper with green insulation, see Details TS-25.

The grounding electrode rod in the Controller Assembly shall be paralleled with the grounding electrode rod in the Service. This

connection shall consist of a continuous stranded #6 insulated conductor. The ground connection shall be on the line side of the electrical entrance terminal block. The continuous #6 stranded and insulated green copper conductor shall connect the ground bus in the electrical service, grounding electrode in the service and grounding electrode to the controller foundation.

I. **Traffic Signal Interconnect (SIC)** – Traffic signal interconnect shall be provided for new signal installations, and for modifications of existing signals which currently do not have interconnect. The interconnect cable shall have its own conduit and shall not share conduit with service conductors, signal conductors, or lead-in cables.

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.

Unless specified otherwise on the plans, six (6) feet of copper and/or fifteen (15) feet of fiber optic cable slack shall be provided in each pull box. Fifty (50) feet of copper and/or one hundred (100) feet of fiber optic cable slack for each signal interconnect cable run shall be provided in the dedicated communications Home Run pull box in front of each signal controller or the last pull box before the controller if a dedicated communications Home Run pull box is not available.

Signal interconnect cable (SIC) shall be 9/125 μm wavelength, 72 to 216 strand, single mode, indoor/outdoor, loose tube, all-dielectric fiber optic cable as specified on the plans. 24 strand fiber shall be allowed where the majority of a pre-existing SIC conduit run's pull boxes are smaller than No. 6.

SIC shall have a footage marking every 4 feet. This marking may be on the outside of the cover or on the inside insulation jacket.

At the discretion of the City, existing SIC may be disconnected by the City and moved out of the work area by the contractor during construction. However, the SIC must be reinstalled by the contractor within seven days of its disconnection. Otherwise, all SIC must remain operational.

Existing copper SIC damaged during construction shall be replaced at the contractor's cost from controller cabinet to controller cabinet on either end of the damage. Splicing of copper SIC is not allowed. Damaged copper SIC shall be replaced with **fiber optic** SIC, including cable, conduit, splices, terminations, patch panels, and pull boxes conforming to current City standards. The contractor shall also be responsible, at the contractor's cost, to make any additional repairs needed to install the new cable from controller to controller.

Existing fiber optic SIC damaged during construction shall be repaired.

Damage

1. Fiber Optic Cable and related facilities damaged during construction shall be replaced/repaired to current City standards and as specified below at the contractor's cost. This work shall include fiber optic cable, conduit, pull boxes/vaults, trenches, concrete, asphalt, traffic control, pull tape, splices, splice enclosures, terminations, labor, etc, as required.

2. Damage is described as a breach in the fiber optic cable jacket, a kink, a break of the cable, or any other condition that causes a reduction in the capacity of the cable.

3. Should fiber optic cable facilities be damaged during construction without visible damage to the cable, the cable shall be tested by a certified fiber optic technician provided by the contractor at the contractor's cost to ensure that there is no internal damage. Should the test show internal damage, the cable shall be replaced as specified below. Otherwise, the cable shall be protected and the facilities repaired to current City standards.

Repair

1. Fiber optic cable running between and terminating at adjacent traffic signals or devices shall be replaced from termination to termination:
   i. All new cable and terminations shall be acceptance tested as required elsewhere in the City standards.
   ii. If the new cable must be pulled through conduits that contain traffic signal phase wiring, then a "MAX CELL" or equivalent sleeve, per City standards, shall be installed in the conduit prior to the installation of the new fiber optic cable.

   b. Pull box adjacent to the damage to controller cabinet.
   iii. No more than 5 feet of slack may be used out of any one pull box.
   iv. Pull boxes where new splices shall occur will be replaced with C48 or PL48 vaults as specified in the City standards
   v. At least 50 feet of slack must be provided in the new splice vault.
   vi. The slack shall be provided in even amounts on either side of the splice enclosure.
   vii. Only fusion splicing meeting City standards by a certified fiber optic technician will be allowed.
   viii. All new cable, splices, and terminations shall be acceptance tested as required elsewhere in the City standards.
   ix. The average optical loss of each splice shall not exceed 0.10 dB. The average is determined by measuring the splice loss in both directions with an OTDR, adding the

two readings, and dividing by two. Testing should be performed for both the 1310 and 1550 nm wavelengths.

x. Splicing will not be allowed in pull boxes or vaults shared with non signal interconnect cables.

xi. If the new cable must be pulled through conduits that contain traffic signal phase wiring, then a "MAX CELL" or equivalent sleeve, per City standards, shall be installed in the conduit prior to the installation of the new fiber optic cable.

2. Fiber optic cable running continuously past multiple traffic signals or devices may be repaired by splicing at adjacent pull box locations.

a. A single splice location may be appropriate if the damage is close enough to the adjacent pull box that the repair may be accomplished by using some of the slack in the existing cable.

i. No more than 5 feet of slack may be used out of any one pull box.

ii. Pull boxes where new splices shall occur will be replaced with C48 or PL48 vaults as specified in the City standards

iii. At least 50 feet of slack must be provided in the new splice vault.

iv. The slack shall be provided in even amounts on either side of the splice enclosure.

v. Only fusion splicing meeting City standards by a certified fiber optic technician will be allowed.

vi. All new cable, splices, and terminations shall be acceptance tested as required elsewhere in the City standards.

vii. The average optical loss of each splice shall not exceed 0.10 dB. The average is determined by measuring the splice loss in both directions with an OTDR, adding the two readings, and dividing by two. Testing should be performed for both the 1310 and 1550 nm wavelengths.

viii. Splicing will not be allowed in pull boxes or vaults shared with non signal interconnect cables.

b. Two splices may be necessary if the damage is not near an existing pull box. In this case, a splice shall be provided on either side of the damage and a new length of cable meeting City standards shall be installed between the splices.

i. Pull boxes where new splices shall occur will be replaced with C48 or PL48 vaults as specified in the City standards.

ii. At least 100 feet of slack must be provided in each vault.

iii. The slack shall be provided in even amounts on either side of the splice enclosure.

iv. Only fusion splicing meeting City standards by a certified fiber optic technician will be allowed.

v. All new cable, splices, and terminations shall be acceptance tested as required elsewhere in the City standards.
vi. The average optical loss of each splice shall not exceed 0.10 dB. The average is determined by measuring the splice loss in both directions with an OTDR, adding the two readings, and dividing by two. Testing should be performed for both the 1310 and 1550 nm wavelengths.
vii. Splicing will not be allowed in pull boxes or vaults shared with non signal interconnect cables.
viii. If the new cable must be pulled through conduits that contain traffic signal phase wiring, then a "MAX CELL" or equivalent sleeve, per City standards, shall be installed in the conduit prior to the installation of the new fiber optic cable.

3. Repair work must **begin within 24 hours** and be **completed within 48 hours** of the damage occurring irrespective of weekends and holidays.

4. Should the contractor be unable to make the repairs within this time frame, the City will complete temporary repairs and bill the contractor for their time and materials at the City's billable rate. The temporary repair shall be treated with the same restrictions, requirements, and care as the original cable. The contractor will still be required to make the permanent repairs prior to completion of the project.

Temporary copper SIC repairs must be made within 48 hours of the damage and provide sufficient bandwidth and reliability for the intended purpose of the copper SIC. Permanent Repairs shall be completed within 30 days of the damage. The City may make the repairs and bill the contractor for the work should the contractor be unwilling or unable to meet these requirements.

Should copper SIC installation be required by the city, the contractor shall test all copper SIC prior to installation:

1. For continuity of each wire pair. Resistance shall be consistent.

2. For high resistance (meggar) testing (250v setting):

a. Each wire pair to ground
b. Each wire pair to the cable shielding
c. Each wire pair to wire pair

3. The test may be in the field or shop

4. A city technician does not need to be present

5. The contractor shall be liable for all inspection costs related to the removal and re-installation of new cable if the untested cable is found to be faulty after installation.

Fiber optic cable shall be acceptance tested, every strand, both before and after installation at both 1310 and 1550 nm wavelengths. All testing shall be documented on OTDR Acceptance Test and Splice Loss Record forms. Losses shall not exceed 1.85 dB per mile of cable including patch panels and splices.

J. **Traffic Signal Conduit** – All new conduit placed in existing roadways shall be buried at a minimum depth of 15" for double conduits and 18" for single conduits below finished grade. All new conduit placed in new roadways shall be installed prior to any paving operations and be buried at a minimum of 18" below finished subgrade with the exception of conduit between detector handholds and the first pull box which shall be buried a minimum of 18" below finished grade. New conduit installed outside of the roadway and sidewalk shall be installed at a minimum depth of 36" below finished grade.

Unless otherwise specified, all signal interconnect (SIC) conduit shall be 2-3" schedule 40 gray PVC conduit with 3 foot radius 90 degree sweeps into each number 6 pull box.

All traffic signal and SIC conduit shall have a Fiber-Tek part number WPTT1250 or approved equivalent pull tape installed along with the conductors/fibers. Approved pull tapes shall consist of a 22-AWG solid copper wire with HDPE Jacket.

Signal conduit diameter sizes shall be 2 inches minimum and 3 inches maximum except conduit runs to pedestrian push button posts shall be one (1) inch.

Existing conduits not to be reused shall be removed from existing pull boxes and the ends shall be plugged solid with grout. Existing conductors shall be removed form said conduits prior to plugging.

Abandoned conduits deemed reusable shall have the line blown out, existing conductors removed, No. 10 green pull wire installed, and the ends of the conduits sealed.

All pull tape shall be a minimum of 250 feet in length without splicing where possible. All pull tape splices shall have the ends knotted together in the pull box and all splices shall be made using 3M scotchlok connectors (models UR or UY) or approved equal to insure a continuous connection from signal controller to signal controller. Once pull tape is installed and all splices are completed, the City signal technician shall ground the tracer wires in the signal cabinet and test the wires for continuity before accepting the work. Should the pull tape

tracer wire fail the continuity test, the Contractor shall repair or replace as necessary to achieve continuity.

K. Traffic Signal Pull Boxes – All pull boxes shall be No. 5 per the City's Construction Standards except as modified by the plans or the provisions below:

1. Advance loop pull boxes shall be No. 6 and shall have a minimum of 20 feet of detector lead-in cable (DLC) and 20 feet of extra loop cable spooled in the pull box.

2. Pull boxes containing any conduits 2 ½" or larger or with more than 3-2" conduits shall be a No. 6 box.

3. SIC pull boxes shall be No. 6.

4. The "Home Run" and "Communication Home Run" pull boxes (typically adjacent to the controller) shall be No. 6 boxes with 12 inch extensions (double stack). Detector loop splicing is not allowed in the "Home Run" pull boxes.

5. PL48 vaults shall be installed at all fiber hub locations as designated by the City and at every fiber optic cable splice point. Vaults shall be installed within the controller pad whenever possible. Where a traffic rated box is required, the C48 (concrete) vault shall be used with a steel checker plate bolt down lid. See Detail TS-14 for additional installation details.

6. Pull boxes shall not be placed within the area of an access ramp unless directed by the Engineer. Pull boxes should be installed a minimum offset of 1' from back of curb, back of walk when within the sidewalk, and from any score or expansion joint. The bottoms of pull boxes shall be bedded in 6 inches of clean crushed rock. Grout in the bottom of pull boxes is not required. The pull box rim and lid shall be flush with surrounding surface. In unpaved areas, the pull box rim and lid shall be 1 inch above the finish grade. Pull boxes located outside of the sidewalk or planter area behind a sidewalk shall be of the Caltrans traffic rated pull box design.

All pull boxes and lids shall be precast reinforced concrete unless otherwise directed by the Engineer.

All pull boxes to be abandoned shall have conductors removed from the pull boxes and conduits and the pull box shall be removed. The remaining hole shall be backfilled and compacted with similar material as the surrounding material. If within a sidewalk, the entire square of sidewalk shall be removed and replace.

Pull box covers shall read "TRAFFIC SIGNAL", except for pull boxes and vaults used solely for traffic signal interconnect. Pull boxes and vaults used solely for copper traffic signal interconnect shall read "SIGNAL INTERCONNECT". Should the signal interconnect pull box or vault contain any fiber optic cable, the cover shall read "TRAFFIC SIGNAL FIBER OPTICS" instead.

L. Pedestrian Push Button (PPB) - Pedestrian push buttons shall be aluminum Type "B" with metal international symbol signs. Push buttons shall meet all Americans with Disabilities Act guidelines and be placed 36 inches above the grade of the closest edge of sidewalk and shall require a reach of no more than 18 inches outside the closest edge of sidewalk. Pedestrian push buttons shall be within five (5) feet of the edge of the access ramp pan (CMUTCD Figure 4E-2). Audible pedestrian signals shall be installed at all new and modified traffic signals in commercial areas. All other buttons shall be solid state, two tone audible, momentary LED type. See the City's website for a list of approved models.

M. Intersection Safety Lighting – Illumination provided by intersection safety lighting at signalized intersections shall meet the following criteria:

1. A minimum of .15 footcandles throughout the crosswalks.

2. A minimum of .6 footcandles at the center of intersection.

Luminaries shall be 400 watt equivalent LED. See the City's website for a current list of approved materials.

Luminaries shall be medium cutoff, Type II or III lighting distribution (MSII or MSIII)

For 400 watt luminaries, two separate 120 volt circuits shall be provided to equally split the power load.

Photoelectric controls shall be Type II and pole top mounted. Wiring from the photoelectric cell assembly to the electrical service shall be #14.

N. Controller/Service Pad – There shall be a minimum 6-inch high curb around the signal controller/service pad, excluding the sidewalk/roadway side of the pad. The minimum curb height shall increase as necessary to ensure no steeper than a 2:1 slope of the native material around the pad. Masonry blocks (not gravity type blocks) may be utilized to achieve the required 2:1 slope. The Contractor shall be responsible for acquiring engineering for retaining walls if the wall is greater than four feet from base of footing to top of wall. Refer to Detail TS-4 through TS-8 for further details.

The service pedestal shall be installed a minimum of six (6) feet from the controller cabinet.

A City of Roseville Encroachment Permit is required for every traffic signal installation and/or modification. The project address for the permit shall be the service pedestal address. This address should be noted on the plans but is obtainable from the City in its absence. Minor modifications by City forces not involving the service pedestal are exempt from the encroachment permit requirement. Should a traffic signal be a part of a larger project, there may be an encroachment permit for the entire larger project and one or more permits for each and every signal installation/modification.

On 332 cabinets, the field wire entrance section of the controller shall face the intersection or as directed by the Engineer.

O. Traffic Signs – Sign codes shall be per the CMUTCD unless denoted otherwise. Typical signs include the R-73 (CA) series mast arm mounted signs, R3-18 mast arm mounted signs, R9-3a and R9-3b signs (where crossing the street is restricted), W3-3 Signal Ahead roadside signs (pavement markings are only necessary where visibility of the signal is limited or where the signal may be unexpected by motorists), and R3 series roadside signs on the stem of a "tee" intersection.

As a minimum, all signs shall be the common size as shown in the Standard Highway Signs manual. On collector and arterial streets, the minimum size of type R1 stop signs shall be 36 inches. Type R1 stop signs on other streets shall be 30 inches. Type R1 stop signs installed on bike trails may be either 24 inches or 18 inches as approved by the Engineer.

Fluorescent Yellow Green (FYG) background colored signs shall be installed for the following sign types: S1-1, S3-1, S4-3, W11-1, W11-2, and W16-7p and W16-9p when used with one of the previously listed signs.

Where crossing the street is restricted at signalized intersections, R9-3a and R9-3b signs shall be installed on the signal pole in the place of the pedestrian signal indication.

In the case of R73 (CA) series of mast arm mounted signs, a common question is whether or not to allow u-turns. This determination is a function of whether or not there is sufficient room for turning radius. The guideline used by the City is that U-turns shall be restricted where less than 44 feet exists between the right lane line of the left turn lane and the face of curb for the opposing direction of travel for single left turn lanes, where less than 36 feet exists between the left edge of the inside left turn lane to the face of curb for the opposing direction of travel for dual left turn lanes, or as required by the Engineer (Detail

TS-15). If u-turns are to be restricted at permissive or no left turn intersections, R3-4 or R3-18 signs shall be installed on the mast arm.

A bicycle signal actuation sign, R10-22, shall be installed in conjunction with bicycle detection. The sign shall be placed adjacent to the bicycle loop on the nearest signal pole or on a sign post per City standards as directed by the Engineer.

W3-3 Signal Ahead signs shall be installed on all approaches to a signalized intersection on the day of signal activation. The signs shall be installed prior to the left or right turn pocket bay tapers at a minimum and shall be mounted on street light poles when possible. Please see Detail TS-16 for additional placement information. Immediately prior to the activation of a new traffic signal. The contractor shall install two (2) orange flags on the "Signal Ahead" signs. The flags shall remain in place for two weeks prior to removal by the contractor.

All existing traffic signs, which are in conflict with the proposed work as shown on the plans, shall be removed by the Contractor and returned to the City. The Engineer shall make the final decision if a question arises as to what represents said conflict.

Efforts shall be made to ensure that all signs in the center median or shoulder areas are not installed next to landscaping or other objects which may impair visibility of the sign nor shall they impair the visibility of the traffic signal.

Internally Illuminated Street Name Signs (IISNS) shall require a City approved layout proof matching existing City LED IISNS's prior to ordering. Only products with prior approval from the City shall be allowed.

Subdivision Signage Requirements:

1. At non-signalized intersections, street name signs shall be provided, and shall conform to Detail TS-17 in the City of Roseville Construction Standards.

2. Subdivision Entrances

- At all entrances to a subdivision off a collector or arterial, install a type R2-1 "25 mph Speed Limit" sign.
- At the first 4-way intersection entering a subdivision, coming off a collector or arterial with a separation of less than 200 ft., install type R1-1 "Stop" signs, bars, and legends on the residential minor streets.

- At the first Tee intersection entering a subdivision, coming off a collector or arterial, install type R1-2 "Yield" sign and bar on the stem of the intersection.
- Install type R7 "No Parking Anytime" signs at the entrance to subdivisions that have a small median/island just off an arterial or collector.
- Medians within and at the entrances to subdivisions shall have there yellow reflective markers installed on top of the median curb with one at the beginning, center, and end of the median nose radius. The markers should be placed so that they face approaching traffic parallel to the centerline of the median. K-4 markers should not be used unless required by the Engineer.

3. Courts

- Install a type W54 "Not a Through Street" sign at the entrance to all Courts or Cul-de-Sac's when you cannot see the end of the roadway from the last intersection. Place the sign on the nearest street light pole when possible.

4. Intersections Within Subdivisions

- All four-way intersections shall have right-of-way controls established on the minor street. On roadways with minor traffic volumes expected, install type R1-2 "Yield" signs and bars. At intersections with heavier expected traffic volumes and/or pass through traffic, install type R1-1 "Stop" signs, bars and legends.

P. Striping – All painted traffic stripes, arrows, and pavement markings shall be constructed with thermoplastic material to the specifications set forth in Section 84 of the Caltrans Standard Specifications (latest edition). Non reflective pavement markers shall consist of ceramic markers only conforming to Section 85-1.04A of the same standards.

The following permanent traffic lane striping shall be raised pavement markings, and placed as one of the following types: Detail 4, 7, 10, 13, 17, 20, 23, 25, 26, 30, 33, 37C, or Detail 38. Thermoplastic striping is also required for placement of Detail 25 and 38.

The following permanent traffic lane striping shall be thermoplastic, and placed as one of the following types: Detail 25, 27B, 38, 39, 39A and Detail 40. Pavement Markers are also required for placement of Detail 25 and 38.

Detail 26 markers shall be placed 2 inches from the face of the median curb.

At all fire hydrant locations, a blue reflective pavement marker shall be installed one foot off paved centerline or median on the hydrant side of the roadway.

Sandblasting of traffic stripes shall not be permitted. Removal of traffic stripes shall be by grinding, or by other methods approved in writing by the Engineer. For removal of pavement markings, a rectangular area shall be ground to prevent ghosting of the original marking and be covered with rectangular area of Type II slurry. Conflicting striping shall be removed completely. Type II slurry of conflicting striping is required when it crosses the new traveled lane. When this occurs, the entire lane shall be slurried from lane line to lane line over the entire length of the conflicting striping. This requirement will not apply to ceramic markers unless specified on the plans.

All striping or pavement markings damaged during construction shall be repaired at the contractor's expense. Repairs shall consist of complete replacement of marking or legends, replacement of sections of thermoplastic striping, and replacement of damaged or missing markers as directed by the Engineer.

The following shall apply when installing traffic stripes and pavement markings:

1. In addition to locations as shown on the plans, bike lane signs and pavement markings shall be installed at no more than one half-mile intervals and following every break in the bike lane striping. The BIKE LANE legend shall be centered in the lane to ensure the legend does not run into the lane striping.

2. A bicycle detector pavement marking shall be installed in conjunction with each bicycle detector per CMUTCD Figure 9C-7 and shall be placed starting 6 inches back of the crosswalk/stop bar.

3. Unless otherwise specified on the plans, crosswalks shall be eleven (11) feet wide, measured from the centerline of the stripe.

4. Traffic stripes and pavement marking shall not be placed over utility covers including, but not limited to, manhole covers, utility boxes, hand holes, or water valve covers.

5. STOP legend pavement marking and limit lines are required with stop signs. YIELD legend pavement marking are not required with yield signs. The yield limit line shall be per the CMUTCD (24" by 26" triangles).

6. Pavement arrows shall be one of the following types unless otherwise directed by the Engineer: Type II (L, R or B), Type III (L, R, or B), Type VI, or Bike Lane Arrow.

7. At signalized intersections with left turn lanes longer than 150 feet the Type II, or Type III arrows shall be placed 20 feet behind the limit line. Where there are dual left turn lanes with staggered limit lines, the arrows in the number 1 left turn lane (closest to the median) shall be placed 15 feet behind the limit line, and the arrow in the number 2 left turn lane shall be placed 20 feet behind the limit line. The intent is to have the two arrows line up side by side, even though the limit lines are staggered.

8. All turn lanes shall have a Type II or Type III arrow at the beginning of the turn lane such that the tail of the arrow lines up with the beginning of the Detail 38 striping. All turn lanes 150 feet or longer shall have a minimum of two Type II or Type III arrows (one arrow for every 150 feet of turn lane).

9. All traffic lane striping shall be discontinued through any four way public intersection from crosswalk, marked or unmarked. Striping shall be continuous through private intersections unless there is a striped left turn lane and/or traffic signal. For public "T" intersections, the through and bike lane striping shall be continuous for the non-intersection direction, i.e. "across the top of the T". However, there shall be no striping within the limits of the crosswalks.

10. At locations where bike lane striping is parallel striping used to channelize traffic, right turn acceleration/deceleration lanes and bus turnouts, both stripes shall be detail 38. Reflective pavement markers shall be placed to the outside of the bike lane.

11. Bike lane striping shall be continuous except at right turn bay tapers, intersections with City streets, and driveways where the centerline/median is broken. See Detail TS-18 for examples.

12. Lanes designated by the Engineer as auxiliary shall be striped as directed by the Engineer. Examples of typical auxiliary lane striping can be seen on Detail TS-19. Bike lane striping along auxiliary lanes shall be modified Detail 38 with 4 foot stripes at 10 feet on center.

13. Left turn arrows shall not be placed in Two Way Left Turn Lanes unless other wise directed by the Engineer.

14. Stop and yield bars shall be 7 feet back from the center of the pedestrian access ramp unless directed otherwise by the Engineer. Where a stop sign is installed with a yellow school crosswalk, a supplemental white stop bar shall be installed 4 feet back from the crosswalk line.

15. Lane line extensions for dual turning lanes shall be placed on a continuous arc as appropriate for a turning 40 foot bus. Triple turning lanes shall be placed to accommodate the turning of a 65 foot total length (California legal) tractor truck-semitrailer (Detail TS-20).

Type K-4 (Type Q in the CalTrans Traffic Manual) markers (aka: Superducks) shall be 36 inches tall and have 3 bands of reflective sheeting per Section A73C of the CalTrans Standard Plans.

Type K-4 markers mounted between two lanes of opposing traffic shall be yellow with yellow reflectorized sheeting. Type K-4 markers mounted between two lanes of traffic traveling in the same direction shall be white with white reflectorized sheeting.

At median curb noses, a yellow Type K-4 marker shall be mounted on top of the curb. A white Type K-4 marker shall be mounted at the nose for a Right turn 'pork chop' island.

Additional City striping guidelines can be found in Section 7, Streets, of these standards and Sections 82, 84, and 85 of the City's Construction Standards.

Q. **Right Turn Lanes** – Right turn lanes shall be provided at signalized intersections:

1. On all main street approaches.

2. On all minor street or driveway approaches with peak hour approach volumes of 60 vehicles or more.

R. **City Supplied Equipment** – City supplied equipment shall be picked up by the contractor at the City's corporation yard (2005 Hilltop Circle, Roseville) upon 10 calendar days notice to the City's inspector. The contractor is responsible to provide all labor and equipment necessary to load, transport, and install the equipment. Equipment provided by the City typically includes:

1. NEMA Type P or Caltrans 332 cabinet (fully equipped)

2. Type 27-22 electrical service with battery backup system

3. 2070L controller

4. Communications equipment

5. EVP equipment with the exception of the cable from the detector to the discriminator

6. CCTV camera

7. WiFi communications equipment

S. **Contractor Supplied Equipment** – Attention is drawn to the following contractor supplied and installed materials:

1. Equipment grounding conductors shall be AWG #8 bare solid copper wire minimum.

2. Two (2) Category 5e and one (1) UL Type SOOW, CSA Type SO, 600 Volt 18/3 Power Cable Color Code 3/C to top of designated pole with 10 feet of slack for each wire at the top of the pole.

3. 16" countdown pedestrian heads. Contact the City for approved vendors and models.

4. Audible pedestrian or solid state, two tone audible, momentary LED pedestrian push buttons. See the City's website for a list of approved models.

5. Internally Illuminated Street Name Sign (IISNS) Mast Arms shall be per TS-11 and TS-12. The loading of the mast arms and the signal pole to which the sign mast arm is attached shall be approved in writing by the manufacturer or a licensed Structural Engineer.

6. Slim profile, LED IISNS's with City Logo. Contact the City for approved vendors and models. Sign proofs must be approved by the City prior to ordering equipment.

T. **Salvaged Equipment** – Salvaged equipment shall become property of the City and shall be delivered by the Contractor upon 24 hours notice. The Contractor shall deliver salvaged equipment to the City's Corporation Yard located at 2005 Hilltop Circle, Roseville, following at least 48 hours advance notice of delivery.

Where signals are being modified or relocated, existing emergency preemption equipment shall be relocated to the new signal poles.

Damaged conduits deemed to not be reusable shall be removed from existing pull boxes and ends plugged solid with grout. Existing conductors shall be removed from said conduits prior to plugging. Contractor shall dispose of said conductors.

Abandoned conduits deemed reusable shall have the line blown out, existing conductors shall be removed, a number 10 green locate wire shall be installed, and the ends of the conduits shall be sealed.

U. Traffic Control – Construction area traffic control shall be installed in accordance with the City accepted projects specific traffic control plan, the approved improvement plans and specifications, the Construction Standards, the City Design Standards, The California Manual on Uniform Traffic Control Devices (CMUTCD), The State of California Standard Plans, and the latest edition of The State of California Department of Transportation Standard Specifications hereinafter referred to as the Cal Trans Standard Specs and as follows:

1. Construction that inhibits free flow traffic shall not occur between the hours of 4 p.m. to 6 p.m. on Monday through Friday without prior written approval of the Engineer. Traffic control lasting more that one hour will be subject to additional time restrictions set by the City's Traffic Section in order to minimize the impact to the public.

2. At least one lane in each direction shall remain open to traffic unless otherwise approved by the Engineer.

3. Turning movement restrictions require prior approval of the City. A changeable message sign (CMS) shall be posted in the direction of travel affected by the restriction a minimum of three days prior to the implementation of the traffic control at the contractor's expense. Wording and placement of the CMS shall be "ACCEPTED" by the City's Traffic Section prior to installation.

4. Traffic control hours are subject to limitation by the City.

5. Lane closures that affect traffic flow may require night work, changeable message signs, and/or certified flaggers at the contractor's expense. The contractor should consider traffic control included in their cost of work and may contact the City's Traffic Section for requirements prior to bidding a job.

6. Approved road closures require 72 hour advance notification to the City, the public and emergency services. Changeable message signs (CMS's) shall be posted in the directions of travel affected by the closure a minimum of 1 week prior to the implementation of the traffic control at the contractor's expense. Wording and placement of the CMS's shall be "ACCEPTED" by the City's Traffic Section prior to installation.

7. A Red Flash Request form must be submitted 48 hours prior to the time the red flash is needed. Allowable hours of flashing operation will be set by the City's Traffic Section and will require early morning, evening, or night work unless otherwise approved in writing by the City's Traffic Section. The Red Flash Request form is on Detail TS-21.

8. Special events shall go through the City's special event process (Contact the City of Roseville's Parks & Recreation Dept. for a Special Events packet). Changeable message signs placed in advance of the event may be required depending upon the size of the event and its impact on traffic movement. Contact the City's Traffic Section for requirements.

9. Special holiday traffic control restrictions are in place from the Thanksgiving holiday through January 3rd each year for various roads throughout the City (Detail TS-23).

TRAFFIC CONTROL PLANS:

All traffic control plans (including signage) shall be per CMUTCD (California Manual on Uniform Traffic Control Devices).

The City's Construction Inspector or Engineer shall determine the necessity of a formal traffic control plan (TCP) submittal based upon the following guidelines:

A TCP submittal will be required if the TCP is anyone of the following:

1. Complicated (to be determined by the City's Construction Inspector)
2. Involves a signalized intersection
3. Longer than 12 hours
4. Not detailed in the CMUTCD
5. Involves road closure or detours

Traffic Control Plans require responsible party contact information, hours of operation (which may be restricted by the City), and duration of work.

TCP submittals require the following minimum review times **per** submittal:

Type of TCP	Min. Review Time
Lane Closure	2 days
Intersection Signal Flash	2 days
One-way traffic control	2-4 days
Detour/Road Closure	3-4 weeks

Note that complicated TCP's may require more review time. Traffic control review time should be included in the contractor's work schedule.

The traffic control plan submittal process is as follows:

1. Three copies of the TCP must be submitted to the inspector.

2. The TCP is reviewed by the City Traffic Section and corrections/modifications are made by the contractor as necessary.

3. The City Traffic Section will stamp the TCP as "ACCEPTED" once the plans are to the City's satisfaction.

4. Two copies of the "ACCEPTED" TCP are returned to the inspector – one copy each for the inspector and contractor.

5. The contractor must have a copy of the "ACCEPTED" TCP on site during the entire time the TCP is in place.

Any deviation from the "ACCEPTED" TCP shall be approved by the inspector and may require re-submittal of the TCP for City review. Failure to maintain the TCP may result in shutdown of the project, suspension of inspection services, correction by the City at the contractors expense, or any combination of the before mentioned.

V. Signal Activation – Functional testing per Caltrans Standard Specification 86-2.14C shall be performed for 5 working days prior to signal activation. All systems shall be in place before functional testing can begin.

On the day of signal activation, the contractor shall be required to have in his possession at the job site all tools, equipment and parts necessary to repair a signal malfunction. These items shall include, but not be limited to, a bucket truck, replacement LED's, wire, etc.

Immediately prior to the activation of a **NEW** traffic signal, the contractor shall install two (2) orange flags on the "Signal Ahead" signs. Flags shall remain in place for two (2) weeks.

Prior to activation of a **NEW** traffic signal, the contractor shall provide a minimum of two flaggers per intersection to control traffic. The number of flaggers may be increased at the request of the City's inspector for large intersections. Each flagger shall wear appropriate safety gear and carry a stop paddle for controlling traffic. The flaggers shall completely stop traffic prior to the signal changing from red flash to full operation. Signal Activation will not be permitted on Friday's or before a designated City Holiday.

W. Roadway Improvements – The designer should be aware of the following requirements regarding civil improvements when working in the roadway:

1. If delay to motorists will not exceed 10 minutes, conduit may be installed as allowed by "Trenching in Pavement Method" as

provided in Section 86-2.05C of the Caltrans Standard Specifications and these requirements

2. The conduit trenches shall be a maximum of six inches wide and two inches wider than the outside diameter of the conduit to be installed. There shall be one inch minimum clearance between the conduit and the trench wall. The trench shall be crumbed clean prior to placement of conduit.

3. Aggregate material in concrete shall be pea gravel. Concrete shall be thoroughly consolidated around the conduit filling all voids.

4. Rock wheel trenching per detail TS-13 and conduit installation in new or existing roadways shall be located along the centerline of the bike lane stripe or stop bar/crosswalk striping. All trench cut shall be hidden by the stripe where applicable. Pre-existing improvements requiring deviation from the centerline of the stripe shall be accomplished within 20 feet from the beginning to the end of deviation. Deviations along bike lane lines shall be to the curb side of the stripe unless directed otherwise by the City. Deviations greater than 20 feet shall require asphalt concrete repair per Item #6 below.

5. Rock wheel trenching parallel to the roadway centerline across acceleration, deceleration, or bus turn out openings that can not be completed per TS-13 upon the same day shall be filled with concrete to the top of the trench and the contractor shall return to complete an 18 inch "T" grind and overlay per CST-TB-1

6. Saw cutting in the street other than rock wheel trenching will require pavement repair per CST-TB-1 or TB-3 and/or grinding between lane lines per City Standards found elsewhere in this document and the Construction Standards.

7. Should the contractor fail to install the conduits in **NEW** roadways prior to the bottom lift of asphalt concrete, the City will require the installation of a Glass Grid matt prior to the final lift of pavement.

8. The contractor is solely responsible to provide all labor and equipment necessary to locate existing underground facilities beyond the information provided by the U.S.A. markings including, but not limited to, metal detectors, wire locating equipment, and potholing.

9. Where combinations of sidewalk or curb and gutter are poured contiguous to existing, all adjoining existing concrete vertical faces shall be doweled per City Standards found elsewhere in this document and the Construction Standards.

10. Curb ramps conforming to the latest ADA, Title 24 requirements, and the City Construction Standards shall be installed at all pedestrian crossing locations within the project area. Existing ramps that do not meet these requirements shall be removed and replaced.

6-3 PREPARATION OF PLANS – Traffic signal plan sheets shall conform to the provisions of Sections 2 and 3 of these improvements standards, including submittal requirements, AutoCAD files, etc. Traffic signal plans shall have one title sheet followed by separate signal and lighting, interconnect, and signing and striping sheets for each intersection. Signing and striping sheets shall be submitted concurrent with signal and lighting sheets for review. Signal and striping plan sheets must be stamped and signed by a licensed Civil Engineer.

A. Title Sheet – The title sheet shall include the following:

1. Title of project, which shall include the location.

2. A vicinity may with north arrow showing the limits of work. The location map is not required to be to scale.

3. Pertinent signature blocks, and revision block.

4. A legend for symbols not found in the Standard Plans (e.g., utility lines, etc.). Below the legend, place the following note: NOTE: SEE STATE STANDARD PLANS ES-1A, ES-1B and ES-1B FOR EXPLANATION OF OTHER SYMBOLS.

5. Controller/Service foundation detail (TS-4 through TS-8), loop layout detail (TS9 and TS-10), and other special details. The service pedestal address shall be place adjacent to these details in large, bold letters.

6. Applicable City of Roseville Standard Notes as published on the City's Web site at www. roseville.ca.us/engineering.

B Signal and Lighting Sheet – The signal and lighting sheet shall be drawn at a scale of 1 inch equals 20 feet, and shall include the following:

1. A north arrow.

2. Existing and proposed field conditions which include, but are not limited to, the following: underground and overhead utilities (including height of lines near signal poles), driveways, fire hydrants, poles, signs, fences, street lights, edge of pavement, curb and gutter, sidewalk, right-of-way line, P.U.E.'s, roadway striping, medians, centerline, pull boxes, curb 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.

3. Pole and equipment schedule (TS-2).

4. Conductor and conduit schedule. The schedule shall include rows showing "percent fill" values, and conduit quantity/size (TS-3).

5. Complete traffic signal design, including but no limited to, the following: conduit runs, detector loops (with input designations), detector handholes, vehicle and pedestrian signals (with phase designation), luminaries, pedestrian pushbuttons (with phase designation), controller, service pedestal, service point, emergency vehicle detectors, signing, striping, interconnect, CCTV Camera, and WiFi equipment.

6. Phasing diagram. Designate type of flashing operation below the phasing diagram.

7. Phasing for emergency vehicle preemption. Typically, protected left turn phases are combined with the concurrent through movement during EV preemption.

C. **Interconnect Sheet** - The interconnect sheet may be drawn at a scale of 1 inch equals 20 feet or 1 inch equals 40 feet and shall include a north arrow.

D. **Signing and Striping Sheet** – The signing and striping sheet shall be drawn at 1 inch equals 40 feet, and shall include the following:

1. A north arrow.

2. Existing signing and striping – dashed or screened.

3. Proposed signing and striping where line types shall closely approximate striping proposed.

4. Centerline stationing with either begin and end modification stationing or lineal feet of modification specified along with the detail.

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