City of Rohnert Park

Traffic Design Standards

TRAFFIC DESIGN STANDARDS
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Volume 1

Design Standards

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ENGINEER'S LIST OF APPROVED ITEMS

for use with Traffic Signal Design Standards

Approved _____ **Date** 7/27/14

1. Traffic Signals – C. Traffic Signal Controller, 170E or 2070E
   Products listed on the Caltrans Qualified Products List (QPL)
   http://www.dot.ca.gov/hq/traffops/elecsys/TEES.htm

2. Traffic Signals – D. Traffic Signal Controller Cabinet, Model 332L
   Products listed on the Caltrans Qualified Product List (QPL)
   http://www.dot.ca.gov/hq/traffops/elecsys/TEES.htm

3. Traffic Signals – E. Traffic Signal Service Cabinet
   Tesco type III-BF service cabinet

4. Traffic Signals – J. Detection
   Econolite, Autsoscope Video Detector System,
   http://www.econolite.com/products/detection.aspx
   ITERIS, http://www.iteris.com/solutions/detection
   MS SEDCO, http://mssedco.com/intersector_sensor.htm
   Aldis, GridSmart, http://www.aldiscorp.com/gridsmart/ on certain applications with City Engineer approval.

5. Emergency Vehicle Pre-emption
   EMTRAC Systems, http://emtracsystems.com/

TRAFFIC DESIGN STANDARDS

GENERAL

A. Traffic Standards shall be used for all public streets in the City of Rohnert Park.

B. The purpose of the standards and specifications contained herein is to establish uniform policies and procedures for traffic engineering functions of the City of Rohnert Park. It is neither intended as, nor does it establish, a legal standard for these functions.

C. The following Traffic Standards designated for use in the City of Rohnert Park substantially comply with the California Manual on Uniform Traffic Control Devices (also known as the California MUTCD), the State of California Standard Specifications, and the State of California Standard Plans; they are to be used in conjunction with the named references for any project within the public right-of-way. Deviations from these standards shall be granted only upon specific written approval of the City Engineer.

D. The latest version of the California MUTCD shall be assumed whenever referenced.

E. These standards are considered minimum and do not preclude the use of a higher standard as directed or approved by the City Engineer.

F. Encroachment onto any City street or right-of-way shall require an encroachment permit issued by the City of Rohnert Park.

DEFINITIONS

"Bike Lane" (see definition in Street Design Standards).

"CAMUTCD" shall mean the California Manual on Uniform Traffic Control Devices, latest edition as adopted by the California Department of Transportation, found on the internet at the following address: http://www.dot.ca.gov/hq/traffops/engineering/mutcd/index.htm.

"City Traffic Engineer" shall mean the City Engineer.

"Collector Street" (see Major Collector & Minor Collector definitions in Street Design Standards).

"FHWA" shall mean Federal Highway Administration

"Public Street" (see definition in Street Design Standards).

"Sidewalk" (see definition in Street Design Standards).
"Street" (see definition in Street Design Standards).

"Traffic Standard Plan" shall mean a typical traffic standard detail of the Traffic Standards and Details of the City of Rohnert Park and Caltrans Standard Plans.

"Traveled Way" means a way or place of whatever nature, publicly maintained and open to the use of the public for purposes of vehicular travel.

1. TRAFFIC SIGNS

A. General

1. The base metal of all signs shall conform to ASTM designation B209, of either 5052-H38 or 6061-T6 alloy, and shall conform to all other applicable current Caltrans specifications for sign materials.

2. Unless otherwise specified by the City Engineer, the thickness of all roadside signs shall be .080 inches, except for mast-arm overhead mounted signs which shall be 0.125 inches.

3. Unless otherwise specified by the City Traffic Engineer, the following sign dimensions shall be used for all warning and regulatory signs:
    a. Federal sign specifications as found in the FHWA Sign Specifications, and California sign specifications as found in the California Sign Specifications.
        1) FHWA signs shall conform to the dimensions for Conventional Road signs indicated by a C, unless otherwise specified in the City of Rohnert Park Traffic Standards or directed by the City Traffic Engineer.
        2) California signs shall conform to the dimensions for STANDARD sizes when more than one set of dimensions are offered. In some instances STANDARD is not specified, and the size of the sign shall then be approved by the City Traffic Engineer.
    b. All Stop Signs shall be 36"x36" in size. At All-Way-Stop controlled intersections the stop sign shall be accompanied with R1-3P "All-Way" plates.
    c. The Standard Size Dimension shall be used for the R73 series.
    d. The R81 Bike Lane sign shall be 18"x24" in size.

e. The FHWA sign for School Pedestrians (S1-1) shall be 30"x30" in size.
f. The R49 shall be used for pedestrian barricades, in accordance with California Sign Specifications.
g. R1-5 signs shall be 30"x30".
h Signs larger than the standard sign may be required or may be granted by written approval by the City Engineer.

4. For No Parking, No Stopping, and Bike Lane signs, the words "Begin" and "End" shall be used in place of arrows.

5. Regulatory, warning and guide signs shall be retroreflective to show the same shape and similar color by both day and night, pursuant to California Manual of Uniform Traffic Control Devices latest edition. The retroreflective sheeting and retroreflective lettering shall be warranteed for a minimum of 10 years. Retroreflective sheeting and lettering of other traffic signs may be required, as specified by the City Engineer.

6. Reflective sheeting shall be used in construction of traffic signs according to the following:
   a. Engineer Grade (Table A)
      All signs not indicated below.
   b. Long Distance Performance Grade (Table B)
      Stop signs, yield signs, stop ahead signs, speed limit signs, keep right signs, no U-turn signs, mast-arm mounted street name signs, street name signs, chevrons, wrong way signs, end-of-road signs, and type 1, 2 and 3 object markers.
   c. Visual Impact Performance Grade (Fluorescent Yellow Green) (Table C)
      Pedestrian crossing signs, school pedestrian signs, bicycle warning signs, and associated supplemental arrows.
   d. High Intensity
      All warning signs shall use at minimum high intensity sheeting (Table B).

Table A – Minimum Coefficient of Retroreflection RA (cd/lux/m^2) for Engineer Grade Reflective Sheeting

Color	Observation Angle	Entrance Angle -4°	30°	40°
White	0.2°	80	35	---
	0.5°	41	21	---
	1.0°	---	---	---
Yellow	0.2°	50	22	---

	0.5°	25	13	---
	1.0°	---	---	---
Red	0.2°	14.5	6.0	---
	0.5°	7.5	3.0	---
	1.0°	---	---	---
Green	0.2°	9.0	3.5	---
	0.5°	4.5	2.2	---
	1.0°	---	--	---
Blue	0.2°	4.0	1.7	---
	0.5°	2.0	0.8	---
	1.0°	---	---	---
Brown	0.2°	2.0	1.0	---
	0.5°	1.0	0.5	---
	1.0°	---	---	---

Table B – Minimum Coefficient of Retroreflection RA (cd/lux/m^2) For High Intensity Grade Retroreflective Sheeting

Color	Observation Angle	Entrance Angle -4°	30°	40°
White	0.2°	250	175	95
	0.5°	95	70	55
	1.0°	10	9.5	9.0
Yellow	0.2°	170	135	50
	0.5°	62	60	40
	1.0°	9.0	8.5	8.0
Red	0.2°	45	30	12
	0.5°	15	12	10
	1.0°	2.0	1.5	1.0
Green	0.2°	45	30	12
	0.5°	15	12	10
	1.0°	1.0	0.8	0.5
Blue	0.2°	20	11	6.0
	0.5°	75	5.0	4.0
	1.0°	0.5	0.3	0.1
Brown	0.2°	12	8.5	2.8
	0.5°	5.0	3.5	2,5

1.0°	0.5	0.3	0.1

Table C –Minimum Coefficient of Retroreflection RA (cd/lux/m^2) For Visual Impact Performance Reflective Sheeting

Color	Observation Angle	Entrance Angle -4°	30°	40°
Fluorescent	0.2°	240	150	55
Yellow	0.5°	165	75	15
	1.0°	45	24	6
Fluorescent	0.2°	325	200	75
Yellow	0.5°	236	100	23
Green	1.0°	65	35	8

B. Traffic Sign Installation

1. All poles shall be 2-inch square unistrut galvanized steel, in conformance with the City Standard Plan STD-705B.

2. Where poles are to be installed in finished surfaces, a minimum 4-inch diameter hole shall first be core drilled to a depth of 36 inches, in conformance with City Standard 705B. The pole shall be set using a ⅓ cement to ⅔ sand mix.

3. Where poles are to be installed in unfinished surfaces, an 8-inch diameter hole shall first be dug to a minimum depth of 36. The pole shall be set using 1 part cement to 2 parts sand mix and 3 parts gravel.

4. Signs shall be installed in accordance with the following specifications and facing traffic in the lane adjacent to which the sign is installed.

    a. "No parking" signs shall be installed at a 30-degree angle toward the traveled way. All other signs shall be installed at an angle toward the traveled way per the sign manufacturer's reflective requirements.
    b. Signs in the median area shall be placed midway between curbs. These signs shall be mounted no closer than six inches from the edge of traveled way, and no farther than six feet from the edge of the traveled way which the sign faces.
    c. Typical installations shall conform to the requirements of Traffic Standard Plan 701.

d. The minimum mounting height for signs shall be seven feet, measured from the bottom of the sign to the near edge of the pavement, except as otherwise noted below.

e. The height to the bottom of a secondary sign mounted below a primary sign shall be a minimum of seven feet, measured from the bottom of the sign to the near edge of the pavement.

f. In areas not subject to pedestrian traffic, the CHEVRON (W81) and ONE WAY (R10) signs shall be mounted at a height of three feet, measured from the bottom of the sign to the near edge of the pavement.

g. Bicycle Wrong Way R5-1h signs shall be installed at the approach to intersections and facing opposite to traffic. They should be installed approximately 100 feet from the intersection or as directed by the City Traffic Engineer.

5. Street Name Signs

a. Overhead street name signs shall be mounted at all signalized intersections.

b. Signs shall conform to the requirements of Traffic Standard Plan 703A.

c. Street name signs installed at signalized intersections shall be mounted to the mast arm per Traffic Standard Plans 703A and 703B. One overhead sign shall be mounted on each mast arm.

d. Single-sheet, double-faced signs shall be used.

e. Where the street changes names at the intersection, the far side mast arm shall display the name of the street to the right and the near-side mast arm shall display the name of the street to the left.

f. When the street name sign is to be mounted on a portion of the mast arm that is level, Hawkins M10J-OCB250FL sign brackets or approved equal shall be used.

g. When the street name sign is to be mounted on a portion of the mast arm that is curved, Hawkins M10J-OCB250AL adjustable sign brackets or approved equal shall be used.

h. Three-quarter (3/4) inch heavy duty stainless steel .032" straps shall be used for street sign installation.

i. With the written permission of the City Engineer, where mast arm mounted signs cannot be used, street name signs installed at signalized intersections shall conform to the requirements of Traffic Standard Plan 705C and the following requirements:

1). Street name signs shall be mounted to the traffic signal standard by the use of a heavy

duty arm bracket for electrolier mounting.

2). Two sets of street name signs shall be mounted at each signalized intersection.

c. The mounting location at non-signalized intersections shall conform to Traffic Standard Plan 705D.

6. Advance Street Name Signs

a. Advance street name signs shall be placed on all arterial streets, and collector streets as required by the City Traffic Engineer. Advance street name signs shall be installed in advance of the street in accordance with California MUTCD guidelines for advance placement of warning signs, Condition A. No advance street name signs shall be placed where the distance between side streets is shorter than 200 feet curb to curb.

b. Advance street name signs shall conform to the requirements of Traffic Standard Plan 704A.

c. Advance street name sign installation shall conform to the requirements of these Traffic Sign Installation Design Standards and Traffic Standard Plan 704A & 704B.

d. On streets without a raised median, the advance street name sign shall be mounted on luminaire poles where possible. If luminaire poles are not available, the advance street name sign shall be pole-mounted on the right side of the traveled way.

e. When mounted on luminaire poles or in a sidewalk setting, the advance street name sign shall be mounted off-center, if necessary, to achieve the minimum setback from the edge of the traveled way per these Design Standards and Traffic Standard Plan 704C.

f. Sign braces shall be used on pole-mounted advance street name sign installations per Traffic Standard Plan 704B.

2. PAVEMENT MARKINGS

A. The following City Standards and Specifications are in substantial conformance with the CA MUTCD and the State of California Standard Plans and Specifications, and are to be used in conjunction with these named references.

B. Lane widths as shown on design documents shall be measured from centerline to centerline of adjacent striping patterns, or, from face of curb to the centerline of the striping pattern.

C. Unless otherwise specified by the City Traffic Engineer, the following State of California Standard Plan details shall be used for all pavement marking installed in Rohnert Park. The CA MUTCD details are indicated for cross referencing.

1. Centerlines shall conform to Caltrans Standard Plan A20A Detail 4. Refer to CA MUTCD figure 3A-101.
2. Lane lines shall conform to Caltrans Standard Plan A20A Detail 10. Refer to CA MUTCD figure 3A-102.
3. No-passing zones shall conform to Caltrans Standard Plan A20A Detail 23. Refer to CA MUTCD figure 3A-104.
4. Left edge lines adjacent to raised medians shall conform to City of Rohnert Park Traffic Standard 721.
5. Striped median islands shall conform to Caltrans Standard Plan A20B Detail 30.
6. Two-way left turn lanes shall conform to Caltrans Standard Plan A20B Detail 33. Refer to CA MUTCD figure 3A-108.
7. Channelizing lines shall conform to Caltrans Standard Plan A20D Detail 38. Refer to CA MUTCD figure 3A-112. Channelizing lines with bike lanes shall conform to Caltrans Standard Plan A20D Detail 38A. Refer to CA MUTCD figures 9C-1, 9C-4, 9C-5, and 9C-6.
8. The 8-foot Type IV arrow shall be used for left- or right-only lanes, and the 10-foot Type I arrow shall be used for through-only lanes. Arrows shall conform to Caltrans Standard Plan A24A. Refer to CA MUTCD figure 3B-24.
9. For all markings relating to bicycle facilities, refer to the CA MUTCD Part 9, Traffic Controls for Bicycle Facilities.
10. Bicycle detector pavement markings as shown in CA MUTCD figure 9C-7 shall be installed at signalized intersections at all approaches that have bicycle detection, as directed by the City Traffic Engineer. The specific location shall be determined by the City Engineer.
11. Unless otherwise specified by the City Engineer, the design width for all Class 2 bicycle lanes shall be a minimum of six feet wide for new construction and a minimum of five feet wide on existing roadways, as measured from the face of curb to the center of the bicycle lane line.
12. There shall be a minimum of three feet between the lip of the gutter and the 6-inch bike lane line.
13. Bike lanes where parking is permitted shall include the optional 4-inch white marking shown in the MUTCD, figure 9C-102 for applications without parking stalls.
14. The standard pavement marking shall be the words BIKE LANE with an arrow indicating the direction of travel, placed in the center of the bicycle lane. BIKE LANE shall be located 40 feet beyond the curb return. On long blocks the BIKE LANE shall be repeated every 1500 feet.
15. The solid bike lane line shall be dropped 96 feet in advance of the intersection, and a broken line carried to the intersection.
16. When installing an intersection limit line, the location shall correspond with possible future crosswalk alignment.

17. Crosswalks installed at a controlled intersections (stop control or signalized) shall use the standard two-bar design. For uncontrolled locations, the continental design shall be used. Two-foot by ten-foot blocks shall be centered on each lane line, centerline, and center of each lane (except bike lanes), to avoid wheel path of vehicles.

D. Pavement Marking lines and legends

All pavement markings shall be thermoplastic pavement markings, on both public and private improvements. At the discretion of the City Engineer, pavement marking paint may be substituted for thermoplastic.

1. Traffic striping shall conform to the applicable provisions of Section 84 of the California Standard Specifications and as directed by the City Engineer.
2. All paint and thermoplastic shall be lead free.
3. The furnishing and applying of thermoplastic pavement marking material shall conform to the requirements of the modified California State Specification No. 8-10-41G-21.
4. Glass beads applied to the surface of the molten thermoplastic material shall conform to the requirements of the modified California State Specification No. 8010-51J-22 (Type II).
5. The following markings shall be installed with the indicated materials:
    a. 4" edge lines shall be thermoplastic with 1.9 and 2.4 index microcrystalline ceramic beads.
    b. 6" bicycle lane lines shall be thermoplastic with 1.9 and 2.4 index microcrystalline ceramic beads.
    c. 8" channelizing lines shall be raised pavement markers and extruded thermoplastic. When adjacent to a bike lane, the raised pavement markers shall be excluded. In existing pavement they shall be thermoplastic with 1.9 and 2.4 index microcrystalline ceramic beads.
    d. Crosswalks, legends, symbols and arrows shall be extruded thermoplastic.

E. Raised Pavement Markings

1. Raised pavement markers shall conform to the shape, types and dimensions of State of California Standard Plan A-20A.
2. All non-reflective raised pavement markers (RPMs) shall be ceramic and shall conform to the requirements and applicable provisions of Section 85 of the most recent State of California Standard Specifications.
3. All retroreflective pavement markers shall conform to the requirements and applicable provisions of Section 85 of the most recent State of California Standard Specifications.
4. The contractor shall provide manufacturer's specifications for all materials prior to the start of work.

5. For application of the raised pavement marker to the pavement surface, the adhesive shall completely surround the perimeter of the marker after the marker has been pressed into place.

F. Temporary Pavement Markings

1. When pavement markings have been obliterated or damaged in construction work zones, temporary pavement markings shall be installed in accordance with these specifications.
2. At the end of each day's work, temporary pavement markings shall be in place on each paving lift that is open to normal traffic flow.
3. Temporary pavement marking materials shall be approved by the City Engineer prior to installation.
4. Temporary pavement marking configurations shall be designed and installed in accordance with the most current California Department of Transportation *Traffic Manual* or as specified by the City Engineer.
5. Temporary pavement markings shall be maintained and replaced by the Contractor until removed in preparation for the next paving course or replaced with durable pavement markings applied on the final wearing course.
6. The Contractor shall remove all temporary pavement markings prior to the next pavement course being applied.
7. Temporary pavement markings shall be applied to clean, dry surfaces in accordance with the manufacturer's recommendations.

G. Pavement Markings Notes

1. Words, symbols, and traffic striping shall conform to the applicable shape, sizes, and colors as outlined in the most current California Department of Transportation *Traffic Manual* or as required by the City Engineer.
2. Existing pavement markings conflicting with the proposed striping shall be removed immediately prior to the placement of the new markings.
3. Eradication of pavement markings (paint and thermoplastic) shall be completed by means mechanical grinding. Painting over as a means of pavement marking eradication shall not be permitted. All holes left in the pavement due to the removal of raised pavement markers shall be filled with enough adhesive to leave a level surface.
6. All pavement markings damaged by a contractor during construction shall be replaced in kind. Temporary markings shall be used until permanent markings are applied.
7. Temporary pavement markers shall be installed prior to the removal of any temporary work zone traffic controls, to provide delineation until the permanent pavement markings are installed or replaced. Damaged or missing temporary markers or markings shall be replaced daily until the permanent markings are installed.

8. Any asphalt concrete dikes installed for pedestrian paths must be painted white with retroreflective beads applied per Caltrans Standard Specification, section 84. The top surface and both sides shall be painted.
9. Crosswalk markings which are trenched through or partially removed due to construction shall be ground out in their entirety and replaced according to current City of Rohnert Park Traffic Standards, or as directed by the City Traffic Engineer.

3. TRAFFIC SIGNALS

A. General

1. The following City Standards and Specifications are in substantial conformance with the CA MUTCD and the State of California Standard Plans and Specifications, and are to be used in conjunction with these named references.
2. Traffic signal and safety lighting equipment shall comply with the requirements of the applicable provisions of Section 86 of the most recent California Standard Special Provisions, Standard Specifications, Standard Plans and Transportation Electrical Equipment Specifications (TEES), these traffic standards, and as required by the City Engineer. All traffic signals shall use LED lighting.
3. Foundations for traffic signal standards shall be constructed per the applicable California State Standard Plans and as required by the City Engineer.
4. All Traffic Signal designs in Rohnert Park shall be approved by the City Traffic Engineer.
5. All deviations from these Specifications shall be approved in writing by the City Traffic Engineer.

B. Traffic Signal Poles, Steel Pedestals, and Posts

1. Traffic signal poles, arms, and related appurtenances shall be installed in accordance with the requirements of the California State Standard Plans or as required by the City Engineer.
2. The chase outlet shown on the California State Standard Plans in the mast arm mounting plate, and in the mast arm mounting plate on the pole, shall be 2 inch minimum diameter and shall be smoothed after galvanizing to facilitate installation of conductors without damaging the insulation.
3. Each pole shall include one 3 inch x 5 inch minimum hand hole for wiring, located within one foot of the base and on the same side of the pole as the mast arm.

C. Model 170E Traffic Signal Controller – Supplemental to California Specification Section 86-3.011.

1. Controller assemblies shall include Model 170E traffic signal controller units and shall conform to the requirements of the most current edition of the "Traffic Signal Control Equipment Specifications," issued by the California Department of Transportation, and to all addenda thereto and

be furnished by the contractor. If specified by the City Traffic Engineer, a Type 2070 controller may be required, which shall conform to the most current Caltrans "Traffic Control Equipment Specification" and all addenda, and as specified on the Engineer's List of Approved Items For Use with the City of Rohnert Park Traffic Standards.

2. A listing of field conductor terminations for each contractor-furnished controller cabinet shall be provided to the City at the job site.
3. The power supply shall be a ferro-resonant type of transformer. Linear and switching power supplies shall not be acceptable.
4. The controller shall have a minimum of eight kilobytes of battery-backed RAM memory on the CPU board.
5. The CPU power control circuitry shall be located on the CPU board.
6. The ACIA baud rates shall be jumper selectable from 19.2 KHz to 307.2 KHz.
7. The controller shall be designed to support three additional ACIA auxiliary communication adaptor ports at addresses 6002/6003.
8. The standby battery assembly shall be located on the front panel swing-out assembly, and shall be easily accessible for maintenance and testing purposes.

D. Traffic Signal Controller Cabinet – Supplemental to California Specification Section 86-3.04

1. The controller cabinet shall be a Type 332L as specified and shown in the Caltrans Traffic Signal Control Equipment Specification, and as specified on the plans and approved by the City Engineer.
2. When the controller is not used, conduit shall run directly to the pull box.
3. The controller cabinet shall be constructed of anodized aluminum and mounted no closer than four feet from the service cabinet.
4. The foundation for the Type 332L cabinet shall conform to the Caltrans Standard Plan ES-3C, Detail D.
5. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.
6. The cabinet shall provide for housing of a battery backup system (BBS) in conformance with Caltrans Standard Specifications.

E. Traffic Signal Service Cabinet - Supplemental to California Specification Section 86-2.11

1. The traffic signal service cabinet shall be a Type III-BF, in accordance with Caltrans Standard Plan ES-2E, and shall meet the following requirements:

   a. Inside dimensions

	Minimum	**Maximum**
Height	41 inches	45 inches
Width	11-3/4 inches	19 inches
Depth	8-1/4 inches	10-1/2 inches

b. 12-gauge steel treated with primer and two coats of baked-on enamel or electrostatically applied thermosetting polyester.
c. A provision for reading the service meter through a window without opening any doors shall be provided. The window shall be clear glass, Lexan or plastic.
d. The cabinet shall be watertight with a weatherproof door and window.

2. The foundation shall be a Type III-B, in accordance with Caltrans Standard Plan ES-2E, and shall be 24 inches deep below ground level and constructed in accordance with Section 86-2.03 of the California State Specifications.
3. The cabinet shall be located no closer than six feet from the distribution pole or pull box.
4. The cabinet shall be mounted no closer than four feet from the traffic signal controller cabinet.

F. Conduit

1. Conduit shall comply with Section 86-2.05 of the California Standard Specifications and the following requirements:
   a. Service run conduit shall be 2-inch minimum diameter.
   b. Any signal run and interconnect conduit shall be 2-inch minimum diameter.
   c. Conduit under sidewalk or planter areas shall have a minimum of 24 inches of cover.
   d. All signal interconnect conduit runs shall contain two (2) 2 inches minimum diameter conduit, one with signal interconnect cable and one spare. Signal interconnect conduit shall connect with the main traffic signal pull box for each traffic signal in the run. For signal modifications, the signal interconnect conduit should run exclusively to the 48" box.
   e. Conduits from the main pull box to the controller shall be two (2) 3-inch diameter.
   f. Conduits under any street shall be 3-inch minimum diameter and shall have a minimum of 24 inches of cover.
2. All conduits shall be Schedule 40 PVC, except pole risers, which shall be Schedule 80 PVC.
3. All underground conduits and metal parts shall be continuously bonded and grounded.
4. All bends and/or offsets shall be made with factory-manufactured sections.
5. All conduits shall have a flat, woven, lubricated soft fiber polypropylene tape (per Caltran's Specifications) provided inside along its entire length and extending 24 inches out of each end.
6. After conduits, wire and tape have been installed, the ends of all conduits terminating in pull boxes shall be sealed with an approved type of sealing compound. Conduits stubbed for future extension shall be capped.

7. There shall be no cutting of existing conduit to create a window for viewing the contact of the conduit. Any conduit that is cut or broken, whether intentionally or not, shall be replaced at the contractor's expense.
8. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.

G. Pull Boxes

1. All pull boxes shall be #5 concrete (California Standard Plan No. ES-8), except the main pull box which shall be a 30-inch x 48-inch minimum size concrete pull box and shall have double covers. Covers shall be marked "Traffic Signal."
2. Traffic signal interconnect conduit shall be installed in separate concrete pull boxes and their covers shall be marked "I.C.".
3. Pull boxes subjected to vehicular travel shall be installed with one-quarter inch steel plate covers (galvanized after fabrication) with a diamond-type cover surface.
4. All pull boxes shall be bolted.
5. Bottoms of pull boxes shall be grouted prior to the installation of conductors. A layer of roofing paper shall be placed between the grout and the crushed rock sump. A one-inch drain hole shall be provided in the center of the pull box through the grout and the roofing paper.
6. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.

H. Conductors

1. All conductors for traffic signal or street lighting systems shall conform to the requirements of Section 86 of the California State Standard Specifications, or as specified herein.
2. All conductors shall be copper and be rated for 600-volt operation.
3. All conductors shall conform to the most current requirements of the National Electric Code (NEC) and shall be labeled by Underwriter's Laboratories, Inc.
4. Colored stripes shall be placed on conductor insulation to identify each phase of vehicle signals, pedestrian signals, pedestrian push buttons, and detectors.
5. All conductors shall be pulled by hand and shall be installed in conduit runs in one operation. The use of winches or other power-actuated equipment shall not be permitted.
6. The maximum number of wires in the conduit shall conform to the specifications of the National Electric Code.
7. #14 AWG conductors shall be used for the following:
    a. Each traffic signal lamp on each phase.
    b. Each pedestrian signal indication on each phase.
    c. Each pedestrian push button and a pedestrian push button common installed into the controller.
    d. Three for spares under each street.

8. Signal Interconnect cable shall be 19AWG, 25-pair (branches) or 50-pair (main run), and meet IMSA Spec. 40-2 requirements, or as determined by the City Engineer.
9. #8 AWG conductors shall be used from the utility service point to service cabinet for traffic signals and safety lights.
10. All signal interconnect cable shall be run exclusively in signal interconnect conduit until the 48" box near the controller cabinet. Signal interconnect cable shall never be run with signal cable.

I. Wiring

1. There shall be no splices of the conductor hot leads for traffic signal light, pedestrian signal light and pedestrian push button in any pull box. There shall be no splicing of interconnect cable and video cable in any pull box. Ground wires may be spliced in pull boxes. All terminal crimps and splices shall be soldered.
2. Subject to Manufacturers recommendation, splicing in pull boxes shall be allowed for the traffic signal neutral, pedestrian push button commons, ground wires and multiple lighting conductors. These shall be straight splices in conformance with Method "A" as shown on California State Standards Plan ES-13A. Tap splices for signal neutral and multiple lighting conductors shall be Type "C" as shown on California State Standard Plan ES-13A.
3. Conductors shall be permanently identified as to function. Identification shall be placed on each conductor or each group of conductors comprising a signal phase in each pull box and near the end of the conductor termination.
4. Identification shall be made by tags or bands fastened to the conductors, using nylon wire ties in such a manner that they will not move along the conductors. Conductors comprising a single signal phase may be grouped together and tagged with a single band provided the band is designed to tie conductors together as well as tag them.
5. Marking on tags shall be by mechanical methods (scribing, etc.) and shall be permanent.
6. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.

J. Detection

1. Video detection shall be used for all approaches. Unless otherwise specified by the City Engineer, video detection equipment shall be selected from the Engineer's List of Approved Items.
2. The detection zone shall extend from the limit line to 60 feet back.
3. Inductive loops shall be used for all advance loops.

K. Loop Detector Wiring

1. All loops shall be type E in accordance with California State Standard Plan No. ES-5B unless otherwise noted, and shall be installed in

accordance with the details shown on the most current California State Standard Plans.

2. Each lane shall have one shielded cable pair lead-in continuous to controller.
3. Splicing of shielded cable pair lead-in is prohibited.
4. Loop wire shall be #12 AWG stranded conductor with USEXLP insulation or Caltrans Type 2.
5. Detector lead-in cable shall be Type B in accordance with the most recent California State Specifications.
6. Detector lead-in cables shall be permanently and clearly marked at cabinet and pull boxes.
7. All advance loop detectors shall have their own detector lead-in cable per approach lane.
8. Type "A" detector hand holes shall be installed per California State Standard Plan No. ES-5D.
9. Design shall comply with these requirements except as otherwise approved by the City Engineer.

L. Detector Loop Wire Sealant

1. The sealant shall be the Elastomeric type as specified in Caltrans Standards 86-5.01A(3)(a)

M. Pedestrian Signals - **Traffic Signal Heads – Supplemental to California Specification Section 86-4**

1. All signal head sections shall be constructed of metal, not plastic.
2. All visors shall be constructed of metal and shall be the full circle type.
3. Countdown pedestrian signals shall conform to Section 4E.07 of the California MUTCD and shall incorporate the international hand and walking person symbols, illuminated by LEDs to form a solid, filled shape. The numbers shall be illuminated by a double row of LEDs to create a block or bold shape. The hand and walking person symbols shall be the overlaid configuration.
4. Messages shall be lunar white WALKING PERSON and Portland Orange UPRAISED HAND (symbol type) in accordance with California State Standard Plan No. ES-3B and the Institute of Traffic Engineers, Standards: "Adjustable Face Pedestrian Signal Head Standard."
5. One of the following types of screen shall be provided, at the discretion of the contractor:
   a. An aluminum honeycomb screen with 3/16-inch cells, 3/8-inch thick, shall be installed tilting downward, at an angle of 15 degrees (+/-2 degrees) out from the top, and shall completely cover the message plate.

      The honeycomb screen shall be covered with a clear, 1/8-inch minimum thickness, acrylic plastic cover supported in an

aluminum frame, or with a 1/16-inch nominal thickness, formed, polycarbonate plastic cover. Screen and cover shall be held firmly in place by the use of stainless steel or aluminum clips or stainless steel metal screws.

b. A 1-1/2-inch deep egg crate-type screen and mounting frame of 0.032-inch minimum thickness 5052-H32 aluminum alloy shall be provided to cover the message plates. The screening shall be mounted in a frame constructed of 0.04-inch minimum thickness aluminum alloy.

The egg crate-type screen shall be installed parallel to the face of the message plate and shall be held in place by the use of stainless steel screws.

6. The screen and frame shall be fabricated from aluminum anodized flat black or may be finished with flat black enamel as specified in Section 91-4.01 of the California State Standard Specifications.
7. Alternate methods may be substituted by the contractor for the above screens providing the results are equal to or superior to those obtained with the above-specified screens as determined by the City Engineer.
8. The pedestrian control system shall consist of the Polara Engineering EZ Communicator Navigator APS or approved equal to be installed at the location shown on the plans. The system shall consist of pedestrian push button stations (EN2 PBS), one Central Control Unit (CCU2EN) and an E-Configurator. Pedestrian signals shall include ADA-compliant vibrating arrow push buttons and audible sounds. The "cuckoo" output shall be used with pedestrian phases north & south. The "peep-peep" output shall be used with pedestrian phases east & west. Any variation from these phases shall be approved by the City Traffic Engineer.
9. Design shall conform to these requirements except as otherwise approved in writing by the City Engineer.

N. Signal preemption

All traffic signals shall provide for preemption by emergency vehicles. Traffic signals near a railroad crossing shall also provide for preemption by the railroad. Refer to Engineer's List of Approved Items for preemption equipment.

4. Construction Area Traffic Control

A. General

The following City Standards substantially conform to the California MUTCD and the State of California Standard Plans and Specifications, and are to be used in conjunction with these named references.

B. When normal operation of any City street or sidewalk is impacted by any construction and/or maintenance operation, compliance with appropriate temporary traffic controls used in work zones shall be required as follows:

1. All contractors, permittees, or agencies doing work in public streets or public right-of-way shall:
   a. Obtain all necessary permits.
   b. Install and maintain required traffic control devices.
   c. Provide flaggers when required.
   d. Provide adequate safeguards for workers and the general public.
   e. Assure that survey crews and other employees working in or adjacent to a traveled roadway wear flagging garments as required for flaggers.
   f. Patrol the construction site as required to ensure that all devices are in place and operating *at all times.*
2. A temporary traffic control plan shall be required for all road closures, detours, lane closures, or other work within the public right-of-way. All Temporary Traffic Control Plans shall conform to the most current version of the California MUTCD and all provisions included in this City of Rohnert Park Standard, and be approved in writing by the City Engineer. A temporary traffic control plan may reference a Typical Application in the California MUTCD if the work zone conditions are identical to those of the Typical Application. If more than one Typical Application is referenced, the temporary traffic control plan shall describe each work zone condition and note when each of the Typical Applications will be used. When deviation from the Typical Application is necessary, a site specific design shall be prepared by a person knowledgeable (trained and/or certified) in the fundamental principles of Temporary Traffic Controls and the work activities to be performed, and shall be approved by the City Traffic Engineer. Such plans shall include coning placement, type, and location of all signs (construction signs, detour signs, street name plates, etc.), barricade placement, flaggers, temporary pavement markings, and any other pertinent information.
3. The most recent edition of the California Department of Transportation's *Manual of Traffic Controls for Construction and Maintenance Work Zones* and Traffic Standard Plans 740 through 741 shall be used as references for determining appropriate signage. Consideration shall be given to such items as bus routes and locations of bus stops, school

walking routes and school crossings; and work hour restrictions such as not allowing work during peak commute hours.

4. Work within the public right-of-way requiring lane closures, flagging, or any other activities that may impact the flow of traffic shall not be permitted during periods of peak traffic, i.e., from 7:30 AM to 8:30 AM and from 4:00 PM to 6:00 PM. Work within these specific hours shall be permitted only through written authorization of the City Traffic Engineer.
5. Flagging against a functioning traffic signal indication is prohibited.

C. Private Development Projects

1. All private development referrals shall be reviewed by the City Engineer to determine if a traffic handling plan is required for the proposed project.
2. If a traffic handling plan is required, the following paragraph shall be included in the response to the referral: "The City Engineer has determined that a Traffic Handling Plan is required for this project. This Plan shall conform to the most current California Department of Transportation's *Manual of Traffic Controls for Construction and Maintenance Work Zones* and Traffic Standard Plans 740 through 741. This Plan shall detail all methods, equipment, and devices to be implemented for traffic control upon City streets within the work zone and other impacted areas. This Plan shall be included as part of the improvement plans".
3. Projects not requiring a traffic control plan shall be required to follow standard practice for construction zone signing and traffic control during construction as per the most current edition of the California Department of Transportation's *Manual of Traffic Controls for Construction and Maintenance Work Zones* and Traffic Standard Plans 740 through 741.

D. Encroachment Permits

1. Encroachment permit applications for projects requiring road closures, lane closures or detours shall be reviewed for conditions.
2. If a traffic control plan is deemed necessary for the road closure, lane closure, and/or detour, the plan shall be approved in writing by the City Engineer prior to approval of the encroachment permit.