CITY OF MORENO VALLEY
DEPARTMENT OF PUBLIC WORKS
TRANSPORTATION ENGINEERING DIVISION

TRAFFIC SIGNAL AND SIGNING/STRIPING DESIGN CHECKLIST FOR PLAN CHECKS

TRAFFIC SIGNAL

A. INTRODUCTION

When plan checking for a traffic signal, safety issues, increasing capacity, and reducing delay are some elements that must be considered. Good traffic engineering judgment must be called upon to provide an integrated traffic signal designed plan check. It is understood that each traffic signal project has unique characteristics. This design criteria is to be used as a general guideline with consideration for special and unique characteristics. The following information was prepared to assist those who plan check traffic signal plans for the City of Moreno Valley.

B. GENERAL CRITERIA

Traffic signal plans and specifications shall reference the most current State of California Standard Plans and Standard Specifications.

Designs shall be consistent with the California Manual of Uniform Traffic Control Devices.

The traffic signal plans shall be designed using the latest AutoCad software.

The Standard Plans page numbers, equipment types, and detail numbers shall be referred to in the project notes and on the plans.

Final project plans shall be on a (4mil) high grade Mylar material. Plan sheet size shall be 24" x 36". The signing and striping plans shall be on separate sheets and be submitted at the same time with traffic signal plans. A title sheet shall be included with the traffic signal and signing/striping plans. The signal plans shall include the following:

- Traffic signal and lighting plan (1"= 20' scale)
- Conductor schedule
- Pole and equipment schedule
- Phase diagram
- Sensor table with proposed operation noted
- City standard border
- North arrow and scale
- General notes
- Construction notes
- Intersection plan with existing and proposed improvements
- Existing and proposed utilities
- Existing and proposed access ramps

C. SPECIFIC CRITERIA

Right-of-way

Plans shall clearly and accurately show existing, proposed and ultimate right-of-way. Evidence of right-of-way shall consist of recorded maps or legal instruments of property transfer. It is necessary that plans show if additional right-of-way is required to construct the traffic signal. If right-of-way is required additional dedication from the developer/City

will need to be processed concurrently with the improvement plans. If the additional property is offsite, a separate dedication will be needed and must be processed concurrently with the plans.

Centerlines

Plans shall show both record centerlines and any appropriate construction centerlines for all streets on plan. Centerline stationing (per S&S standards).

Jurisdictional Boundaries

Jurisdictional boundaries such as City and County limits shall be clearly shown on the plans. The respective jurisdictions shall be labeled on each side of the boundary line.

North Arrow

North Arrow shall be oriented up or to the right on all plans. The major street shall be horizontal on the plan unless otherwise agreed to by City staff.

Signature Blocks

Standard City Signature blocks shall be provided on the plans for each agency involved with the project. The plans shall be signed & stamped by the Registered Civil or Electrical Engineer (as appropriate) responsible for the preparation of the design.

Base Map

The plans shall clearly show all existing, proposed, and ultimate roadway geometrics including but not limited to the following:

- Curb and gutter
- Sidewalk/Access ramps
- Asphalt curb and berm
- Edge of pavement
- Driveways
- Drainage improvements

Lines and Symbols

The appropriate line weights, line style, symbols, construction notes, and abbreviations shall be used on all improvement plans. Refer to the Caltrans Standard Plans A10B, ES-1A and ES-1B.

Dimensions

Complete dimensioning shall be shown. This includes road and lane widths, right-of-way, turn lane storage lengths, striping taper lengths, distance of advance detector from stop bar, and placement distance of all signs and markings.

Access Ramps

Access ramps shall be installed for all crosswalks, whether striped or not, existing, or are proposed per the American with Disabilities Act (ADA).

Access ramps shall be shown and constructed per the street improvement plans and City of Moreno Valley Standard No. 214A, 214B, and 214C.

Traffic Signal Poles

Traffic signal poles shall be installed per the Caltrans Standard Plans.

Custom or unique pole and mast arm designs will not be permitted.

Wherever possible, traffic signal poles to accommodate the ultimate condition shall be installed. Wind loading for 100 MPH shall be used for all traffic signal poles.

Poles shall be placed within five feet of the crosswalk or the extension thereof. If this maximum distance cannot be maintained, a pedestrian push button post shall be installed.

Median-mounted poles shall not be permitted except for unusual design requirements.

Pole height shall be 30 feet for standards with street lighting.

Mast arms for all directions

The mast arm length will vary depending on the number, location, and configuration of signal heads to be installed.

Wherever possible, the ultimate mast arm shall be installed.

Tenon mounts shall be provided and dimensioned for any anticipated future signal heads. Unused tenons shall be covered in a waterproof, durable and removable manner.

Traffic Signal Heads

Near right heads shall be installed for all approaches.

A minimum of two indications shall be provided for each phase, including overlap phases.

All signal indications shall be 12-inch light emitting diode (LED) as approved by Caltrans. All traffic signal heads shall be metal. Terminal compartments shall be provided for all side and top mounted heads.

Back plates shall be shown for each traffic signal head.

Luminaires

Luminaires shall be 120 Volt, 250 Watt high pressure sodium vapor (H.P.S.V.), full cut-off flat glass fixtures unless otherwise noted. Lighting calculations may be required to insure appropriate lighting levels are attained.

Luminaries mast arms shall be 15 feet unless otherwise noted.

Luminaires shall be placed at each far right approach (“T” intersection – rotate simplex 90 degrees, counterclockwise).

Existing street lights which conflict with the traffic signal safety lighting shall be identified on the traffic signal plans and/or "To be removed by SCE or serving utility."

Internally Illuminated Street Name Signs

Internally illuminated street name signs shall be Type A and utilize LED illumination.

All Internally Illuminated Street Name Signs shall be fabricated and installed per the City of Moreno Valley Standard No. 419, 419A, and 419AR.

Photo-Electric Controls

Photo-electric controls shall be type III and shall be installed inside the Type III-CF service enclosure.

Pedestrian Signal Heads

Pedestrian signal heads shall be Type C with international LED displays and aluminum honeycomb Type 1 screens. Pedestrian modules shall include countdown timers.

Pedestrian signal heads shall be placed on the same pole as the associated vehicle indication, unless otherwise directed.

Audible Traffic Signal

Audible traffic signals will normally not be installed as part of a new traffic signal installation. However, if an intersection has a demonstrated need, based upon City criteria, then the audible pedestrian traffic signals will be incorporated into the design and construction of the traffic signal.

Audible pedestrian traffic signals are used in conjunction with standard pedestrian activated traffic signals to emit two distinct audible signals that resemble bird calls; the “Cuckoo” walk sound is used for north-south walk direction and the “Peep-Peep” walk sound is used for east-west walk direction.

Pedestrian and Bicycle Push Buttons

Pedestrian Push Buttons (PPB) shall be Type B and mounted on the traffic signal poles. PPB's shall not be placed further than five feet from the associated crosswalk. Pedestrian push button posts shall be installed when signal poles cannot be installed within five feet of the associated crosswalk.

Pedestrian push buttons shall conform to the provisions in Section 86-5.02, "Pedestrian Push Buttons" of the Standard Specifications and these Special Provisions. Attention is directed to State of California Standard Plan ES-5C.
Paragraph 3 of Section 86-5.02, ”Pedestrian Push Buttons” of the Standard Specifications is deleted.

Pedestrian push buttons shall be Type B.

Bicycle Push Buttons (BPB) shall be installed per City of Moreno Valley general plan designated bikeway system at a proposed traffic signal location. BPB's shall be mounted four feet above finish sidewalk grade and wired to the bike logic inside the controller cabinet.

Pull Boxes

Number six pull boxes shall be installed unless otherwise noted. A note to this effect shall be included on the plans.

Number five pull boxes shall be installed for advance detector loops, and mid-run locations.

Mid-run pull boxes shall be noted on the plans.

Maximum spacing of pull boxes shall not exceed 200 feet.

A pull box shall be installed within five feet of each traffic signal and lighting pole.

Pull boxes shall not be placed within an access ramp or within one foot of any access ramp.

Conduit

All conduits shall be “Hot Dipped” galvanized rigid metal steel. Non-metal conduit shall not be permitted except for utility service. Conduit sizes shall be determined based on 26% maximum fill per NEC requirements.

The following table shows the minimum conduit sizes for the various applications:

- Interconnect Only 4 -1 1/2” HDPE
- Interconnect to controller cabinet 2”
- Interconnect into controller cabiner 2”
- Detector Lead-in Cable Only 1 1/2"
- Street Crossings 3"
- Controller to Adjacent Pull Box 2-3"
- Power Service 3"
- Lateral Crossing 3"
- 45 degree sweeps for interconnect

In numbering conduit runs, it is preferred to label run one furthest from the controller, rise in number to the "home-run" into the controller, and continue to rise from the controller to the last conduit run.

Detector Loops

Detector loops shall be Type E and identified by number, intersection leg, and phase, for example, 1-S-8.

Detector spacing for the left turn lane shall be 10 feet (four loops/lane). For the through movements, detector spacing shall be 10 feet (two loops/lane). The front loop will extend one foot beyond the crosswalk or limit line.

Detector loops for the left turn lanes and through lanes shall be installed to have vehicle counting capabilities.

Advance detector loop distance from the limit line/back of crosswalk shall be per current State of California Traffic Manual Chapter 9, CA MUTCD, Section 4.

Detector loops shall provide for bicyclists/motorcycles in accordance with the latest CalTrans standards.

Detector Schedule

A detector schedule shall be included on the plan and shall indicate the proposed operation of each detector loop set.

Detectors units shall be shelf mounted, two channels with adjustable delay and extension timing capabilities.

Power Source

The power source shall be clearly shown on the plans. It shall be the Engineer's responsibility to obtain the power location from the serving utility company.

120/240 Volt dual meter service is required. One meter will serve the traffic signal, the other will serve the luminaires.

Circuit breakers shall be installed per the current City ‘s specifications.

A three inch SCH 40 PVC conduit with pull rope shall be designated between the service point and the service equipment enclosure per the serving utility company's requirements.

A ten foot service conduit riser shall be designated for utility pole service points.

Service Equipment Enclosure

The service equipment enclosure shall be Type III-CF special provisions call-out per the CalTrans Standard Plans and City's standard special provision requirements.

Location of the service equipment enclosure shall be the curb return area closest to the service point unless otherwise required. A service address shall be provided on the traffic signal plan and included on the service equipment enclosure.

Controller Assembly

Local intersection Controller Assembly and cabinet shall be per the most current City of Moreno Valley specifications.

Controller assemblies shall be installed in the appropriate location per the following guidelines:

- Not obstructing existing or proposed landscaped corner cutback areas or decorative entry monuments.
- Easy access for maintenance personnel with adequate visibility of vehicular movements.
- Avoid poor drainage/flooding areas.
- Avoid collision prone locations.
- Avoid obstructing pedestrian/handicap access movement.

Phase Diagram

Phase diagram shall be the N.E.M.A. dual-ring type. Signal phasing shall be:

- Phase 2 FNBT
- Phase 4 FEBT
- Phase 6 FSBT
- Phase 8 FWBT

With corresponding left- turn phasing.

Required Notes

- Plans shall show General Notes.
- Plans shall show Construction Notes.

D. MISCELLANEOUS

Street Improvements

No proposed street improvements may be shown on the traffic signal plan; refer to the street improvement plans for all the civil work required.

A construction traffic control plan for the street improvements may be required if one or more of the following situations occurs:

- The complexity of the street improvements jeopardizes safety for the construction workers and the traveling public.
- The roadway geometry poses confusion for the traveling public.
- If required by City or other affected agency for any reason.

Truck turning capability shall be demonstrated for all movements. The minimum design vehicle shall be the STAA truck, unless otherwise approved.

Utilities

It is the design engineer's responsibility to contact all utility companies/agencies to obtain existing and proposed overhead and underground facilities. This information shall be shown clearly and accurately on the plans.

Conflicts between existing utilities and proposed traffic signal equipment shall be identified on the plans by the design engineer during the design process. The appropriate solution to the conflicts shall be coordinated with the serving utility company prior to finalizing the design.

Developer shall be responsible for utility clearance for the required traffic signals.

Emergency Vehicle Pre-emption

Opticom detector cable Model #138 shall be indicated in the conductor schedule. Opticom detectors for each approach and phase selectors shall be installed in the controller cabinet to provide for a fully operational pre-emption system.

Communication Conduit

Separate communication conduits of 4" (4-1/12" HDPC) shall be installed from the master controller assembly to the local controller assembly or between local controller assemblies with separate P48 pull boxes. Conduit with signal wiring shall not be used for communications.

Interconnect cable shall be a minimum of six pair #19 gauge copper conductor per the City Standard No. 421.

Specifications shall refer to the Standard Specification section number and shall be based on current City Standard Special Provisions.

The special provisions should be modified as appropriate for the specific project.

Engineer's Estimate

A complete engineer's estimate of construction quantities and costs shall be provided with each plan check starting with the second submittal.

Environmental Clearance

Environmental clearance must be obtained for all traffic signal projects. Project conditions shall initiate environmental clearance procedures through the Planning Department.

E. SIGNING AND STRIPING

The signing and striping plans shall be on separate sheets and be submitted at the same time with traffic signal plans if it is applicable. Scale on plans shall be 1"=40' minimum. All signing and striping plans shall be in conformance with the latest edition of the CA MUTCD.

General Requirements

Signing/striping plans and specifications shall be checked using the most current State of California Standard Plans and Standard Specifications.

The Standard Plans page numbers and detail numbers shall be referred to in the project notes and on the plans.

Final project plans shall be on a (4mil) high grade Mylar material. Plan sheet size shall be 24" x 36". The signing and striping plans shall include the following:

- All signs sizes shall be for conventional roadways unless otherwise noted on plans. Signs shall be installed per the City Standard No. 400,401, and 402.
- All stripes, signs, and pavement markings shall be reflectorized. Stencils for pavement markings shall match City of Moreno Valley's Standard stencils exactly.
- All striping and marking details shall match Caltrans Standard Plans details.
- All conflicting stripes and pavement markings shall be removed by wet sandblasting. Conflicting signs and raised pavement markers shall be removed.
- All removals of signs and markings shall be the responsibility of the contractor.
- Painted traffic stripes and painted pavement markings (if allowed) shall be applied in two coats. Pavement markings shall be applied with airless stencil truck unless approved otherwise.
- The location and installation of "Blue Dot" type II marker placement shall be per the City Standard No. 422B and 422C.
- All removed signs shall become the property of the City unless otherwise noted. Salvaged materials shall be delivered to the City Yard at 15670 Perris Boulevard.
- Lane lines shall be paint; pavement markers shall be thermoplastic (except for speed limit markers).

Required Notes

- Plans shall show General Notes.
- Plans shall show Construction Notes.

Plans

- Plans shall include an abbreviation list for symbols and abbreviations used on the project.
- Centerline stationing (100 foot intervals) shall be shown on plans, and will correspond with centerline stationing shown on traffic signal plans or street improvement drawings.
- Show scale and north arrow on each sheet.
- The street name signs placement shall be per City Standard No. 404.
- Show existing signing and striping with labels and a thin line weight with a short dashed or dotted style.
- New striping to be painted shall be shown with thick line weight, solid line style.
- Indicate, with appropriate note, any existing signs and any removal/installation on existing pole.
- Construction note number and type of sign/marking shall specify all signs.
- All existing and proposed signs shall be indicated on the plans. All existing traffic control devices within the project limits shall be shown.

- Pavement marking locations shall be dimensioned from the centerline of the nearest cross street. Markings shall be specified by Construction Note number and type. Examples of pavement markings to be shown on the plans are as follows: • Lane Arrows • SIGNAL AHEAD • Crosswalks • Limit lines.
- Dimensions for all road paving, traveled lanes, and right of way widths shall be shown.
- Tapers on pavement for roads merging lanes or lane drops shall be per Caltrans standard.
- New parking restrictions must be clearly depicted on the plans.
- Identify all private streets and driveways. Any road not maintained by the City of Moreno Valley must be clearly marked on the plans.
- Identify adjacent developments with tract number, parcel map number, etc.
- Jurisdictional boundaries should be shown with heavy line.
- Signing and striping plans that involve a school frontage must indicate the name of the school, bus loading zones, entrance and exit driveway markings, and parking restrictions on plans. School zone traffic control shall conform with the Chapter 7, CA MUTCD.
- The crosswalk locations on the plans shall be per City Standard No. 411.
- Title Block, approval name, and signature block for signing and striping plans shall be the same as the traffic signal and street improvement plans.
- Type “F” white channelizers shall be used at all merging lanes or lane drops. The channelizers shall be spaced at 25’ for merging lanes, and a minimum of 3 reflectors shall be installed.
- The intersections with vertical and horizontal obstructions shall be checked for sight distance requirement, using the City Standard No. 125 and 126.
- The signing "No Outlet," when qualified, shall be placed in newly constructed tracts. "Dead End" will be installed on cul-de-sac or stub streets if over 500' in length, or where sight distance is limited by horizontal and/or vertical curve(s).

Left Turn Storage

The minimum storage length for a signalized intersection shall be 200 foot. The minimum storage length for an un-signalized intersection shall be 150 foot unless directed by the Transportation Engineering Division to utilize other storage lengths.

At un-signalized intersections, storage length may be based on the number of turning vehicles likely to arrive in an average of two-minute period during the peak hour. As a minimum, space for two passenger cars should be provided. The transition length shall be determined based on the Highway Design Manual, Chapter 400.

FINAL THOUGHTS

It is the mission of the Transportation Engineering Division to move people and goods in a safe and efficient manner. To assist in the achievement of this goal, this plan checklist has been developed and implemented. The above information is intended to maintain the highest level of consistency possible in reviewing and approving traffic signal and signing/striping plans prepared by the City of Moreno Valley and the development community.