CITY OF VISTA
CALIFORNIA

GUIDELINES FOR THE PREPARATION OF TRAFFIC SIGNAL DESIGN PLANS

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GUIDELINES FOR THE PREPARATION OF TRAFFIC SIGNAL DESIGN PLANS

NOTE: Revisions to these guidelines shall be noted in the revision log below. The Engineer of Work should check with the Engineering Department of the City of Vista to confirm the copy in use is updated with the latest revisions.

REVISION LOG

PAGE NO. (of previous guidelines)	SECTION / SUBSECTION	REVISION DATE	CHANGE
ALL	ALL	10/09/2007	New – Traffic Signal Manual
ALL	ALL	09/12/11	Deleted: Traffic Signal Manual New: Guidelines for the Preparation of Traffic Signal Design Plans, HYH
ALL	ALL	04/04/2012	Update, HYH
Page 1	Section II	02/04/2013	Modified note 4 under "The Engineer of Work shall", HYH
Page 5	Section IV	02/04/2013	Modified note 14 under "Traffic Signal Notes" HYH
Page 8	Section IV	02/04/2013	Modified note 9 under "Construction Notes", HYH
Pages 7-10	Section IV	07/03/2014	Updated notes 2, 9 & 12 and added notes 24 & 25 under "Construction Notes", HYH
Pages 4, 5, 7 & 9	Section IV	11/30/2015	Updated some general notes and construction notes, HYH
Pages 4 - 10	Section IV	8/28/2017	Modified notes 2 & 3 under "Traffic Signal Notes", Grammar changes to notes under "Traffic Signal Interconnect Notes", Modified notes 1, 2, 6, 22 under "Construction Notes".

I. FORWARD

These guidelines establish uniform procedures for the design of both new and modified traffic signals in the City of Vista. It is not intended as a textbook or as a substitute for established standards, experience in the principles of traffic signal design and sound engineering judgment, but rather as a guideline to uniformity and to provide the designer with sufficient information to prepare the desired plans with a minimum of uncertainty.

II. STANDARDS

Traffic signal design and installation in the City of Vista shall conform to the following:

1. City of Vista Development Code
2. City of Vista Standard Drawings
3. The latest edition of Caltrans Standard Plans
4. The latest edition of Caltrans Standard Specifications
5. The latest edition of Caltrans Standard Special Provisions
6. The latest edition of the California Manual on Uniform Traffic Control Devices (CA MUTCD)
7. The latest edition of the Caltrans Traffic Manual (only the parts which are still in effect)
8. The latest edition of the Standard Specifications for Public Works Construction ("Green Book"), including supplements thereto
9. The latest edition of the San Diego Regional Standard Drawings
10. Project Plans and Specifications

The Engineer of Work shall:

1. Be a Civil Engineer (not a Traffic Engineer) with current California registration and shall sign and seal the final Plans.
2. Meet with the City's Project Engineer to review design concepts and shall prepare a "redlined" concept drawing for discussion.
3. Obtain an electrical service point using the applicable process for the serving utility.
4. Prior to beginning design, send a map of the area where the improvements are proposed to all utility companies (San Diego Gas & Electric, AT&T, Cox Communications, Time Warner Cable, Vista Irrigation District, City of Vista, Cities of San Marcos and Oceanside and the County of San Diego if project is near their boundaries) so that the utility companies can provide as-builts of their utilities. Next, send to the

utility companies draft design plans showing the proposed improvements along with the utilities plotted from the as-builts so that the utility companies can verify the location of their utilities and check for conflicts with the proposed improvements. If conflicts are foreseen, utility companies, at their discretion, shall pothole locations of potential conflicts prior to completion of the design plans. Final approved design plans must also be sent to the utility companies for final verification of utility locations and conflict checks and for use in utility relocation, if needed.

5. Perform an as-built and record search to depict on the Plans all existing utilities (water, sewer, storm drain, traffic signal fiber optic, other communications infrastructure, etc.) within the entire footprint of the work area.

6. Verify that all existing traffic signal equipment and any proposed traffic improvements conform to current standards. Additionally, the Engineer of Work shall verify if the existing equipment can be re-used, replaced, salvaged and/or disposed of.

7. Submit electronic CAD and PDF drawings reflecting as-built changes as submitted by the contractor using bubbles and deltas. The Engineering Department will plot the as-built, obtain signatures and file the as-builts in the City's system. Note that the original electronic CAD file must be saved separately prior to making any as-built changes.

III. DESIGN PLANS

Plans shall be designed on City standard "D" size sheet including the title sheet. The City's standard title sheet with all notes will be provided by the City as detailed below. The quality of drafting and lettering size shall conform to the highest standards in order to ensure legible reduced prints. Plans shall be produced in the AutoCAD version currently used by the City's Engineering Department. In addition to original signed mylars of all plan sheets, a copy of the original electronic AutoCAD file and an electronic copy of the signed plans in PDF format shall be submitted to the City on a CD.

DESIGN PLAN GUIDELINES

1. A traffic signal design plan shall contain the following elements:
   - Standard improvement plan title sheet with notes. The standard title sheet with all the notes will be provided by the City as detailed in Section IV below
   - Standard traffic signal design title sheet with Traffic Signal Notes and applicable Construction Notes. The standard title sheet with all the notes will be provided by the City as detailed in Section IV below
   - If applicable, standard interconnect title sheet with General Notes, Traffic Signal Interconnect Notes, applicable Construction Notes and details. The standard title sheet with all the notes and details will be provided by the City as detailed below
   - If applicable, standard title sheet with signage and striping notes and details. The standard title sheet with all the notes and details will be provided by the City as detailed in Section IV below
   - Plan view drawing showing traffic signal improvements
   - Conductor schedule, pole schedule, phase diagram, detector assignment and pole placement detail
   - Design sheets showing other improvements as necessary

- Construction and post construction BMPs and erosion control design. Sample BMP details and notes are available for review and electronic dissemination by the City

2. The above design sheets can be rearranged to reduce the total number of sheets as space allows. For example, the Traffic Signal Notes may be placed on the standard improvement plan title sheet and the applicable Construction Notes may appear on the traffic signal design sheet itself. Another example is to combine the Traffic Signal Notes and the signage and striping notes and details into one sheet.

3. A traffic signal design plan shall use NEMA phasing conforming to the California Manual on Uniform Traffic Control Devices (CA MUCTD), Part 4, Highway Traffic Signals.

4. The traffic movements on the major roadway shall be designated phases 2 and 6. Phase 2 is to be used to designate either the northbound or eastbound movement. If the two intersecting streets are apparently of equal importance, the City's Engineering Department shall designate which of the two is the major roadway.

5. North shall always be oriented up or to the right on all design plan sheets. The major roadway shall always be horizontal on the plan.

6. Signal design plans shall be drawn at a 1" = 20' scale.

7. Pole identification numbering (or lettering) shall always increase clockwise around the intersection with the lowest numbered pole being always on the corner where the controller cabinet exists or is to be located.

8. Conduit run identification numbering shall start at the farthest conduit crossover from the controller cabinet corner and always increase in clockwise direction toward the home run pull box on the controller cabinet corner. The final home run conduits shall have the highest identification numbers.

IV. TITLE SHEET AND PLAN NOTES

CITY CIP PROJECTS DESIGN PLAN NOTES

For City Capital Improvement Program (CIP) projects, obtain the needed standard title sheets (include the border, signature boxes and all pertinent notes and details) from the Engineering Department.

PRIVATE DEVELOPMENT PROJECTS DESIGN PLAN NOTES

For private development projects, obtain the needed standard title sheets (include the border, signature boxes and all pertinent notes and details) at the link below:

http://www.cityofvista.com/departments/communitydev/forms.cfm

TRAFFIC SIGNALS NOTES

The following notes appear on the traffic signal design standard title sheet. Please read these notes prior to beginning design.

1. Contractor shall coordinate service details and scheduling with San Diego Gas and Electric well in advance of need.

2. Contractor shall prepare a traffic control plan and obtain the signed approval of the plan from the City Engineer or his representative for all work impacting vehicular, bicycle and pedestrian traffic and for any traffic signal shutdown. The plan is to be prepared by a California licensed construction zone traffic control contractor (C31 Contractor) or a California registered Traffic or Civil Engineer. The plan will depict all signing, striping, delineation, flagging and all other traffic control devices necessary to the operation, in the opinion of the City Engineer or his representative. Actual working hours for construction and for traffic signal shutdown will be determined by the City Engineer or his representative upon review of the traffic control plan and based on the impact to traffic. For City CIP projects, the Project Specifications provide more details regarding traffic control requirements and working hours.

3. Contractor shall notify the City of Vista Public Works Department and the City's Traffic Engineer or his representative, through the City's Construction Inspector, a minimum of two (2) working days before implementing any traffic signal system shutdown already authorized by an approved traffic control plan.

4. Contractor shall notify the City's Traffic Engineer or his representative, through the City's construction inspector, a minimum of three (3) working days prior to activation of new or modified traffic signals and shall arrange for a field meeting to perform the activation. The City's Traffic Engineer or his representative will prepare a new or a modified timing sheet as appropriate and will provide the timing sheet to the contractor during the activation field meeting. Activations shall be accomplished within a two-hour period on weekdays between the hours of 9:00 AM and 2:00 PM upon approval from the Traffic Engineering Division.

5. Contractor shall arrange to have a signal technician, employed by the controller manufacturer or his representative and qualified to work on the controller, present at the project site for the entire duration of the activation field meeting.

6. Contractor shall maintain in operation all existing traffic signals and street lighting for the benefit of the public during the progress of the work. Existing electrical services, traffic signal equipment, traffic signs, and street lights that are being replaced or relocated shall remain in service until the replacement facilities are installed and operational or useable.

7. Conduits between adjoining pull boxes shall be 2" PVC Schedule 80 unless otherwise noted on the Plans. Conduits crossing streets shall be 3".

8. All trenching for conduit installation must be accomplished using underground boring methods unless specifically noted on the Plans.

9. Underground signal conductors shall not be spliced.

10. All pull boxes shall be No. 5 unless otherwise noted on the Plans.

11. Pull boxes shall not be located in or within 1' of any part of any curb ramp (sloped portions of the ramp; wings; grooves; or landings).

12. All pull box and vault covers shall be marked with the words TRAFFIC SIGNAL.

13. The contractor shall verify with the City's Inspector and Traffic Engineer the precise field locations of all traffic signal equipment prior to installation.

14. An "AS-BUILT" drawing clearly showing the actual locations of all traffic signal components and other improvements shall be submitted by the contractor and approved by the City Engineer prior to the acceptance of the improvements.

15. All equipment and parts called out on the Plans to be salvaged must be delivered to the City's Public Works Satellite Yard located at 2430 Lupine Hills Drive. However, the contractor must first contact one of the following Public Works staff members at least two working days in advance to coordinate delivery of the salvaged equipment and parts:

    Keith Gardner.....760-518-4738
    JD Rubidoux.....760-644-6797

TRAFFIC SIGNAL INTERCONNECT NOTES

The following notes appear on the standard traffic signal interconnect design title sheet. Please read these notes prior to beginning design.

1. Conduit runs are shown on the Plans in schematic form only.

2. Contractor shall verify linear feet of conduit and fiber optic cable by field inspection.

3. Distances shown on the Plans are approximate. Contractor shall carefully measure actual distances and make allowances for slack before cutting fiber optic cable.

4. All trenching for conduit installation must be accomplished using underground boring methods unless specifically noted on the Plans.

5. Conduits must be installed within three feet of the face of curb or, if no curb exists, within two feet of the edge of pavement, except as necessary to avoid conflicts.

6. If open trenching is allowed for certain segments, then trench paving must be performed in accordance with City of Vista Standard Drawing Numbers SRF-8A & 8B, Type B.

7. Fiber optic cable shall be installed in 2" PVC Schedule 80 conduit.

8. All conduit bends are to be factory made.

9. Pull boxes shall be No. 6E unless otherwise noted on the Plans, spaced no more than 500' apart and shall not be closer than three feet to driveways.

10. Pull box locations between intersections shown on the Plans are approximate and may be field located by the Contractor with the approval of the City Inspector to avoid obstructions and facilitate construction.

11. Pull boxes shall not be located in or within 1' of any part of any curb ramp (sloped portions of the ramp; wings; grooves; or landings).

12. All pull box and vault covers shall be marked with the words SIGNAL COMMUNICATIONS.

13. It is the responsibility of the contractor to determine the exact location of all loop detectors prior to commencing work in the area. The contractor is responsible for avoiding all loop detectors during construction and shall not cut or break any loops. Any damage to existing loop detection during construction shall be the responsibility of the contractor to replace. Boring under loop detector lead-in cable is allowed provided that a minimum 5' distance be observed on each side of the loop, and operations do not result in pavement sag or loop damage.

14. Contractor shall replace, at contractor's expense, any fiber optic cable in which the attenuation of any single mode strand at 1310 nm exceeds 0.4 dB/Km, excluding single point events at authorized splices and connectors.

15. When three or more fiber optic cables enter an enclosure, each fiber optic cable shall be labeled indicating the location of the far end of the fiber optic cable.

16. Deflection limits of all single mode fiber optic cable shall not exceed 20 times the outside diameter of the fiber optic cable being installed.

17. Concrete sidewalks near controller cabinets that are in conflict with proposed conduit routing and impracticable to bore or tunnel under shall be removed and replaced between expansion joints, and not saw cut through slab. Removal and replacement of concrete shall include complete slab.

18. A spandrel section of an existing cross gutter that is in conflict with proposed conduit routing and is impracticable to bore or tunnel under shall be removed and replaced between expansion joints, and not saw cut through the slab. Removal and replacement of concrete shall include complete spandrel sections from joint to joint.

19. An "AS-BUILT" drawing clearly showing the actual locations of all system components and other improvements shall be submitted by the contractor and approved by the City Engineer prior to the acceptance of the improvements.

20. All equipment and parts called out on the Plans to be salvaged must be delivered to the City's Public Works Satellite Yard located at 2430 Lupine Hills Drive. However, the contractor must first contact one of the following Public Works staff members at least <u>two working days in advance</u> to coordinate delivery of the salvaged equipment and parts:

    Keith Gardner.....760-518-4738
    JD Rubidoux.....760-644-6797

CONSTRUCTION NOTES

The following sample construction notes shall be used on traffic signal design Plans and traffic signal interconnect design Plans as applicable. Please note that these notes are general and only cover the most common installations in traffic signal and interconnect design. The notes may be modified and other notes may be added as appropriate. In addition, a note need not be shown on the plans if the item(s) is not being installed.

1. Furnish and install:
   a. McCain, Inc. model 352i ATC anodized aluminum cabinet with Corbin#2 locks. Cabinet shall be equipped with a 16-channel output assembly and a 48-channel input assembly.
   b. Foundation per Caltrans Standard Plan Drawing ES-3C
   c. McCain, Inc. model ATC 2070 traffic signal controller
   d. Latest version of McCain, Inc. Omni signal timing program
   e. Model 412C system memory module
   f. EDI model 222 two-channel loop detectors
   g. PDA2 assembly Model 242 DC Isolator units
   h. Latest Tomar Optical Signal Processor
   i. McCain, Inc. 24VDC Model 206 power supply
   j. Model 210ECL conflict monitor
   k. All necessary load switches

Alternative equal components may be used as approved by the City.

2. Furnish and install Type III-BF City approved traffic signal and lighting service (Address XXXX XXXXX) per SDG&E requirements, SDG&E Electric Underground Meter & Service Location Form available in the Project Specifications Appendix and Caltrans Standard Plan Drawing ES-2E in an anodized aluminum cabinet enclosure per Caltrans Standard Plan Drawing ES-2C. Provide a metered 100A-3 Pole, 240V main circuit breaker; a metered 50A-1 Pole 120V traffic signal circuit breaker; and a metered 30A-1 Pole, 240V lighting circuit breaker. Obtain an electrical permit from the City's Building Department prior to beginning this work. Contact the City after completing this work for an electrical inspection and approval.

   FOR PRIVATE DEVELOPMENT PROJECTS, USE THIS NOTE 2 INSTEAD:

   Furnish and install Type III-BF City approved traffic signal and lighting service per SDG&E requirements, SDG&E Electric Underground Meter & Service Location Form (to be obtained by Engineer of Work or Contractor) and Caltrans Standard Plan Drawing ES-2E in an anodized aluminum cabinet enclosure per Caltrans Standard Plan Drawing ES-2C. Provide a 100A-3 Pole 240V main circuit breaker; a metered 50A-1 Pole 120V traffic signal circuit breaker; and a metered 30A-1 Pole, 240V lighting circuit breaker. Obtain an electrical permit from the City's Building Department prior to beginning this work. Contact the City after completing this work for an electrical inspection and approval.

3. Furnish and install a three-inch (3") DB electrical service conduit and pull rope from the SDG&E service point to the electric meter service per SDG&E requirements and as shown on the SDG&E Electrical Underground Meter & Service Location form.

4. Furnish and install loops for vehicle and bicycle detection per City of Vista Standard Drawing TRF-5; Caltrans Standard Plans; Caltrans Standard Specifications; the Green Book; and the California MUTCD.

5. Furnish and install an Iteris RZ-4 AWDR (or City approved equal) camera and equipment necessary for video detection of vehicles and bicycles. Location of cameras shall be determined in the field by the City's Traffic Engineer and Inspector. Camera locations shown on these plans are to illustrate design intent only and are subject to adjustment due to field conditions or equipment requirements. Provide the latest Iteris Vantage Edge processor card for each camera; a Vantage Edge Connect card to stream the camera images back to the TMC; Samsung LCD (or City approved equal) control display (Cyberview BNC+S-Video video input) in a lockable rack-mount drawer; computer mouse; all cables; and accessories and make all connections and programming necessary for full and proper operation of the video detection system.

6. Furnish and install a complete Alpha battery backup system including:
   A. Alpha FXM 1100 inverter
   B. Four Alpha cell 100 XTV batteries
   C. Alpha SE48-1616 cabinet with generator option; UATS bypass switch; and an 8" riser
   D. AlphaGuard battery charge management system model AG-CMT-4SC-P

7. Furnish and install the latest Tomar (or City approved equal) emergency vehicle pre-emption (EVP) detector assembly (including mounting hardware and cables) for each direction. EVP shall be mounted per detail "B" of Caltrans Standard Plan ES-4E.

8. Furnish and install a mast arm-mounted reflectorized street name sign per City of Vista Standard Drawing Numbers TRF-3A through TRF-3E.

9. Furnish and install a Polara Navigator APS series audible-tactile model number EN29VN1-Y accessible pedestrian signal system (or City approved equal), complete with push button stations (PBS) and a handheld Polara Navigator Configurator. All equipment must be ordered per the Polara EZ Communicator Navigator Order Form. All stations must be programmed with custom Voice on Location (VOL) messages per the Polara Custom Voice Message Details Form. Both forms are included in the Appendix of the Project Specifications.

   <u>FOR PRIVATE DEVELOPMENT PROJECTS, USE THIS NOTE 9 INSTEAD:</u>

   Furnish and install a Polara Navigator APS series audible-tactile model number EN29VN1-Y accessible pedestrian signal system (or City approved equal), complete with push button stations (PBS) and a handheld Polara Navigator Configurator. The Contractor is to complete the Polara EZ Communicator Navigator Order Form and have it approved by the City prior to ordering equipment. All stations must be programmed with custom voice on location (VOL) messages per the Polara Custom Voice Message Details Form. The City completes the Polara Custom Voice Message Details Form, but the Contractor must request its completion from the City at least two weeks prior to need.

10. Furnish and install the latest model of GE Lumination (or City approved equal) countdown pedestrian signal indications.

11. Furnish and install the latest model of 12" GE Lumination (or City approved equal) red, yellow and green signal indications.

12. Furnish and install LED safety lighting system, catalog number STR-LWY-3M-HT-05-E-UL-SV-700-R-UTL per appendix of Project Specifications, or City approved equal.

    FOR PRIVATE DEVELOPMENT PROJECTS, USE THIS NOTE 12 INSTEAD:

    Furnish and install LED safety lighting system, catalog number STR-LWY-3M-HT-05-E-UL-SV-700-R-UTL, or City approved equal.

13. Furnish and install a new 44" X 32" X 36" splice vault for fiber optic cable per Detail 'A' on sheet XX. Contractor shall provide two (2) grounding rods, lifting rings and bolts. Cover shall be 24" X 36" with 1" diameter pick holes. All metal surfaces shall have a galvanized finish.

14. Furnish and install a No. 6E pull box (with extension) with 45 degree bends for fiber optic cable per Detail 'B' on sheet XX. No.6E pull boxes shall be spaced no more than 500 feet apart.

15. Furnish and install 2" PVC Schedule 80 conduit for fiber optic cable. All conduit bends shall be factory made. Furnish and install a new No. 8 AWG solid bare ground wire and a pull rope or tape inside the conduit.

16. Furnish and install a new trunk Corning Altos, all-dielectric, fully water-blocked, loose tube, gel-free, 12-strand single mode fiber optic (SMFO) cable (or City approved equal). Contractor shall coil 20 feet of trunk 12- strand SMFO cable slack in every pull box or vault per Detail 'C' on sheet XX unless noted otherwise on the Plans. All fiber optic cable, including branch cables, shall be installed in its own conduit separate from electrical conductors.

17. Furnish and install a new branch Corning Altos, all-dielectric, fully water-blocked, loose tube, gel-free, 12-strand single mode fiber optic (SMFO) cable (or City approved equal).

18. Furnish and install a new splice enclosure per Detail 'D' on sheet XX. Splice enclosure shall be the latest Corning model or City approved equal. It shall have a minimum 48-fiber splice capability; provide cable ports as required; have a moisture-tight sealing arrangement; and have re-entry capability.

19. Perform necessary splicing of the 12-strand trunk fiber cable with the 6-strand fiber cable per Detail 'E' on sheet XX. All remaining unused fiber strands in the trunk cable must remain intact and if cut, must be rejoined by splicing.

20. Furnish and install a Vilink Model VK 230 (or City approved equal) fiber optic modem to be installed in the traffic signal controller cabinet per Detail 'F' on sheet XX. Provide all cables; connectors; and auxiliary equipment necessary to establish communication.

21. Contractor shall provide and install all necessary equipment at the traffic signal and at the Civic Center to establish full communications between the traffic signal and the Civic Center. This includes, but is not limited to, connectors; fiber optic pig tails; splice closures; splice enclosures; splice trays; connector panels; patch panels; cords; etc.

22. Furnish and install a Bosch Ruggedized HD (MIC-7230-W5) remote-control camera to be mounted on traffic signal pole. The camera installation is to include all other necessary modems, cabling and programming to make the camera operational:

    a. MIC-DCA-HWA: MIC hinged DCA, white; includes stainless steel conduit adapter (male M25 to female ¾-inch NPT)
    b. MIC-PMB: Pole mount bracket
    c. MIC-WMB-WD: MIC550/MIC612 Wall mount bracket white
    d. NPD-6001A: Midspan, single port, 60W, AC in

    Installation shall include all trenching; conduit; cabling; ancillary equipment; and splicing between the nearest splice vault or pull box; the traffic signal controller cabinet; and the new camera.

23. Contractor shall adjust conduit, pull boxes and cabinet locations to clear existing utility facilities except with regards to minimum conduit depth.

24. Furnish and install sign as noted on plans on traffic signal mast arm per Caltrans Standard Plan ES-7N Detail “U”.

25. Furnish and install sign as noted on plans on signal pole using saddle bracket per Caltrans Standard Plan RS4.