

METROPOLITAN TRANSPORTATION COMMISSION

HUB SIGNAGE PROGRAM

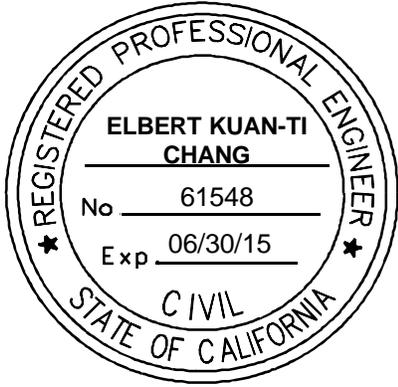
**SANTA ROSA REGIONAL TRANSIT MALL REAL-
TIME TRANSIT INFORMATION DISPLAY**

APPENDIX A-1: TECHNICAL SPECIFICATIONS

**100% SUBMITTAL
FINAL**

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These Technical Specifications have been prepared under the direct supervision of:



Elbert K Chang
Elbert Kuan-ti Chang
RCE 61548

5/11/15
Date

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I. GENERAL

Provide all labor, materials and equipment necessary to purchase, install and integrate outdoor-rated and indoor-rated real time transit information signs at Santa Rosa Regional Transit Mall

As detailed in *Table A-1.1: Summary of Sign Quantities*, the scope of work includes the base bid for real time, wayfinding and transit information signage at guaranteed prices for a period of one hundred eighty (180) calendar days following written acceptance of installation of signage by MTC Contract Manager or designee at the final hub completed by Contractor. Contractor selection shall be determined by lowest base bid price listed in Section I, Price Quotation in *Appendix B, Bid Form*. MTC shall, at its sole discretion, determine whether to exercise purchase of any combination of additional signs.

A. ORDER OF PRECEDENCE

Should there be conflicts or contradictions between these Technical Specifications and the Design Plans, in the general case, these Technical Specifications shall take precedence and prevail over the Design Plans. However, in the case where the Design Plans provide more explicit detail than these Technical Specifications, the Design Plans shall prevail. In all cases, should there be any differences in requirements between these Technical Specifications and the Design Plans, the more stringent requirements shall apply.

The Contractor shall thoroughly examine the Contract Documents, Design Plans and Technical Specifications and shall report any discrepancies, ambiguities or differences, and shall request interpretation of the MTC Contract Manager or designee before proceeding with the work.

B. DESCRIPTION OF WORK

1. Indications on the drawings or in any section of the specifications of an article, material, operation or method require that the Contractor shall provide each item or service of quality noted. The Contractor shall also perform each operation prescribed according to the conditions stated and shall provide all necessary labor, equipment, materials and incidentals to complete the work to the satisfaction of the MTC Contract Manager or designee.
2. Questions pertaining to the work that require clarification shall be referred to the MTC Contract Manager or designee for clarification prior to bid date. After execution of the Contract, no allowance will be made in favor of the Contractor for failing to check dimensions and methods of construction and reporting any clarifications.
3. Generally, the drawings indicate dimensions, positions, and kinds of materials as are necessary to give a comprehensive idea of the construction contemplated. All authorized alterations affecting the requirements and information given on the Design Plans shall be in writing. These Technical Specifications are intended to indicate the quality and application of materials. Work not particularly detailed, marked or specified shall be the same as similar work that is detailed, marked or specified.
4. If differences in sign quantities occur, the sign schedule shall be used to determine the quantity.
5. Contractor shall field verify Electrical Engineering design as listed below prior to ordering electrical materials.
6. Real time signs must comply with latest MTC's sign specifications titled *Regional Real-Time Signs Physical Requirements and Specifications (Version 5.0)* which is available from MTC Project Manager.

7. At hubs where real time signs are installed above existing transit information display signs, Contractor shall keep existing transit information display signs and poles in place while drilling the required holes in the poles and installing pull rope in existing conduits.
8. While the Contractor may propose alternative means and methods for sign fabrication and installation, substantial deviations from design intent will not be considered, and extensions to project schedule related to any substantial deviation requests will not be considered. The MTC Contract Manager or designee shall determine whether any deviations shall be considered as substantial. Any delays resulting from the review of alternative means and methods proposed by the Contractor will not constitute an automatic extension of the schedule and no delay penalties will be granted nor paid therefore.
9. Submittals such as shop drawings shall be submitted to the MTC Contract Manager or designee as instructed elsewhere in these Technical Specifications.
10. The Shop Drawings shall be approved by the MTC Contract Manager or designee before any work involving the drawings is performed. It is expressly understood that approval of the Contractor's shop drawings shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the Design Plans and these Technical Specifications. Approval of the shop drawings shall not operate to waive any of the requirements of the Design Plans and these Technical Specifications, or relieve the Contractor of any obligation thereunder, and defective work, materials and equipment may be rejected notwithstanding the approval.

Table A-1.1: Summary of Sign Quantities

Sign Type	Description	Qty
R	Outdoor-rated display (IP65)	2
R	Indoor-rated display (IP54)	1

C. CODES, STANDARDS, AND PUBLICATIONS REFERENCE

1. Codes, standards and publications listed and referenced in these Technical Specifications form a part of these Technical Specifications. Except where otherwise indicated, the latest editions on the date bids are due shall be applicable.
2. ANSI/ICC A117.1-2003 – Standard for Accessible and Usable Buildings and Facilities
3. ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)
4. National Fire Protection Association (NFPA) – NFPA 70: National Electrical Code
5. State of California Department of Transportation, Standard Specifications, May 2006
6. Contractor guarantees that at any time up to and including ten (10) years from the date of final acceptance by the Metropolitan Transportation Commission (MTC) sign coatings will conform to these minimum performance characteristics:

7.

FILM PROPERTY	METHOD	REQUIREMENT
Weathering- Units Color Retention	ANSI/ASTM D-2244	Maximum 5E (Hunter) Color Change
Weathering Color Retention Step	ASTM D-1535 Specifying Color by the Munsell System (Visual Comparison with "Control" Sample)	Maximum Difference: 0.5 Hue 0.1 Value Step 0.4 Chroma Step
Weathering- Gloss Retention Degree	ASTM D-523 60 Degree Glossimeter	Maintain High Gloss Minimum of 75
Weathering- Chalk Resistance	ASTM D-659 "Evaluating Degree of Chalking of Exterior Paints"	Minimum Rating of 6
Resistance to Acid Acid Pollutants	30 Minutes Exposure to 70% HN03 Vapors Color Change	Maximum 5 E units
Direct Impact Resistance	Gardner Impact Tester 1/10 inch Distortion ASTM D-2794	No Chipping or Removal of Material
Abrasion Resistance	ASTM D0968 Abrasion Resistance of Coatings of Paint, Varnish, Lacquer, and Related Products by the Falling Sand Method	40 Minimum
Temperature Resistance	-	-65 deg F to +200 deg F
Weathering and Protection Resistance	-	(see note 1)

1. All static signs shall be resistant to steam, acids, aromatics, scratching, ink, stickers, adhesives, and paint. All markings, inks, or paints shall be readily removed with soap and water or environmentally safe solvents without harm to the signs.

D. SUBMITTALS

1. Submit manufacturer's technical literature and related diagrams for the following:
 - a. Real-Time Displays
2. Manufacturer Information
 - a. Provide overview literature describing manufacturer's overall scope of products and manufacturing capabilities.
 - b. Provide URL for manufacturer's web site; web site must provide access to technical data, images and detailed product for all items that from the product's assembly. Otherwise, the detailed information shall be provided by the Contractor that has been generated by the manufacturer.
 - c. Provide manufacturer's toll-free telephone number for product support.
 - d. Provide complete list of materials proposed for use under this contract, including manufacturer's catalog number and description for each product in typewritten form. Obtain MTC Contract Manager or designee's approval of materials before proceeding.

E. SHOP DRAWINGS AND PRODUCT DATA PROCEDURES

1. The Contractor shall visit the site to determine specific installation conditions. Contractor shall then submit to the MTC Contract Manager or designee for review, Shop Drawings indicating the specific mounting devices, materials and processes for each sign type and mounting condition.
2. Shop Drawings shall be submitted for review prior to fabrication. Shop drawings shall show design, materials (kind, thickness, and finish), dimensions, connections, mountings and other details necessary to ensure that they accurately interpret the Design Plans and these Technical Specifications and shall also show adjoining work in such detail as required providing proper connection with it.
3. Contractor will not be allowed to submit partial sets of shop drawings for any sign type. Partial submittals will be returned without any review. No allowance for additional time in the schedule shall be granted should any shop drawings be returned for incompleteness.
4. Shop drawings shall be presented in a clear and thorough manner, drawn to scale and not subsequently reduced to fit a drawing format. Title each drawing with the Contract name and sign number(s) and location(s).
5. Identify field dimensions; show relation to critical features, work, or adjacent products.
6. Contractor shall provide detailed shop drawings for every sign type which shall include materials, dimensions, mountings, colors and any other installation details for the complete sign assembly prior to fabrication of the signs. These shop drawings shall be submitted for review and approval by the MTC Contract Manager or designee.
7. Shop drawings that are submitted shall be complete drawings that have been fully engineered with all applicable and relevant details provided in each drawing for each sign type.
8. It is expressly understood that approval of the Contractor's shop drawings shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work in conformity with the requirements of the Design Plans and any specifications. Approval of the

shop drawings shall not operate to waive any of the requirements of the plans and any specifications or relieve the Contractor of any obligation thereunder, and defective work, materials and equipment may be rejected notwithstanding the approval.

9. Field meetings may be called to facilitate review at the discretion of the MTC Contract Manager or designee.
10. Contractor may request, in writing, permission from the MTC Contract Manager or designee to use equipment or material of a different type in place of the equipment or material specified.
11. The MTC Contract Manager or designee, before considering or granting the request, may require the Contractor to furnish, at the Contractor's expense, evidence satisfactory to the MTC Contract Manager or designee that the equipment or material proposed for use by the Contractor is capable of producing work equal to, or better than, that which can be produced by the equipment or material specified.
12. If permission is granted by the MTC Contract Manager or designee, it shall be understood that the permission is granted for the purpose of testing the quality of work actually produced by the equipment or material and is subject to continuous attainment of results which, in the opinion of the MTC Contract Manager or designee, are equal to, or better than, that which can be obtained with the equipment or material specified.
13. The MTC Contract Manager or designee shall have the right to withdraw any permission at any time that the MTC Contract Manager or designee determines that the alternative equipment or material is not producing work that is equal, in all respects, to that which can be produced by the equipment or material specified.
14. Upon withdrawal of permission by the MTC Contract Manager or designee, the Contractor will be required to use the equipment or material originally specified and shall, in accordance with the directions of the MTC Contract Manager or designee, remove and dispose of or otherwise remedy, at the Contractor's expense, any defective or unsatisfactory work produced with alternative equipment or material.
15. Neither MTC nor the Contractor shall have any claim against the other for either the withholding or the granting of permission to use alternative equipment or material, or for the withdrawal of the permission.
16. Permission to use alternative equipment or material in place of equipment specified will only be granted where the equipment or material is new or improved and its use is deemed by the MTC Contract Manager or designee to be in the furtherance of the purposes of these Technical Specifications.
17. Nothing in these Technical Specifications shall relieve Contractor of the responsibility for furnishing materials or producing finished work of the quality specified in these Technical Specifications or in the Design Plans.

F. DELIVERY, STORAGE AND HANDLING

1. Deliver materials to installation site in manufacturer's original packaging. Handle products in accordance with manufacturer's instructions. Store in dry, secure location, protected against direct sunlight and excessive heat.

G. QUALITY ASSURANCE

1. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of a specified quality.
2. Comply fully with manufacturer's instructions, including each step in sequence.
3. Should manufacturer's instructions conflict with the Contract Documents, Design Plans and these Technical Specifications (i.e., project plans and these Technical Specifications), the Contractor shall request clarification from the MTC Contract Manager or designee before proceeding.
4. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
5. Work shall be performed by persons qualified to produce workmanship of specified quality.
6. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
7. To establish a standard of quality, design, and function desired, portions of these Technical Specifications and Design Plans have been based on products of manufacturers mentioned hereafter. When specific products of manufacturers are mentioned, it is to be noted that equal products of other manufacturers shall be reviewed by the MTC Contract Manager or designee upon receipt of adequate supporting data and samples in accordance with CSI Section 01620, Product Options and Substitutions.
8. Produce high quality and accurate shop drawings clearly showing all of the necessary installation, mounting and construction details for each sign type.

H. PERFORMANCE STANDARDS

1. Provide written calculations and stamped shop drawings by a professional engineer legally authorized to practice in the state of California. Signage must be engineered to meet International Building Codes (IBC) including any and all wind-loading and seismic criteria.

I. EXTRA MATERIALS

1. In addition to materials required for completions under this contract as described in the Design Plans and Technical Specifications, furnish four one-gallon units of each color of finish paint to the MTC Contract Manager or designee for future touch-up work.
2. Submit samples of all finish coatings proposed for use on the sign panels, brackets, frames, trim, poles, base plates, etc.; samples shall be on actual materials, where practicable, in size not less than 10 inches x 10 inches square; show colors and finish sheens representative of final installations; label samples to indicate material, methods, colors, and sheen. Submit samples to the MTC Contract Manager or designee for approval before proceeding.

II. PRODUCT MATERIAL AND PROCESSES

A. MATERIALS – GENERAL

1. Each required sign structure and panel type is specified in the Design Plans as well as the general fabrication and mounting details. The Contractor shall develop construction details and fabrication engineering on the shop drawings. Final responsibility for the development and execution of the fabrication and installation detail drawings rests with the Contractor.
2. Provide materials, which have been selected for their surface flatness, smoothness and freedom from surface blemishes wherever exposed to view in the finished unit. Exposed-to-view surfaces, which exhibit pitting, seam marks, roller mark, die marks, “oil-canning”, stains, discoloration, or other imperfections on the finished units will not be acceptable.
3. Where metal surfaces or fasteners will be in contact with dissimilar materials, coat the surfaces with epoxy paint or provide other means of dielectric separation as recommended by manufacturer to prevent galvanic corrosion.

B. REAL-TIME DISPLAYS (RTD) (SIGN TYPE R)

1. *Description*

- a. The Real-Time Display (RTD) shall provide hub and sign-location specific real-time information regarding transit departures. It shall be installed in interior and exterior locations with several different mountings, including mounting to a Transit Information Display Structure (existing or new) or on existing walls. Refer to the Design Plans for details on the different installation and mounting options.
- b. In addition to the requirements and specifications contained within these Technical Specifications, the RTD assembly shall meet or exceed all of the requirements and specifications defined in the latest *Regional Real-Time Signs, Physical Requirements and Specifications* (Version 5.0) which is available from the MTC Project Manager.

2. *General*

- a. The Real-Time Display shall consist of the following elements:
 - i. Screen (Sign)
 - ii. Sign Controller (Field Hardened Computer)
 - iii. Communications and Telemetry (i.e., Ethernet, wireless, serial, etc.)
 - iv. Enclosure (Housing)
 - v. Mounting Elements
- b. The RTD shall be furnished with an operating system, graphical user interface and commercially-available Internet browser software (Internet explorer (latest version) or approved equivalent) that shall have the ability to display the specific contents of a web page generated by the 511 website for real-time transit information. See Display Configuration below for more details.
- c. The RTD units shall be furnished and installed as a complete and fully integrated unit that is assembled, tested and delivered by a single manufacturer. As approved in writing by the MTC Project Manager or his designee, the individual elements that form each RTD assembly may be manufactured by different companies, but each RTD assembly shall be assembled and delivered as a single integrated unit, fully tested at the assembling

manufacturer's facilities for compliance with these Technical Specifications. There will be no exceptions.

- d. The RTD units shall be fully warranted by the manufacturer who assembles, tests and delivers the units. Refer to the Warranty section elsewhere in the Invitation for Bid and these Technical Specifications for more details on the terms of the warranty.
- e. The testing of the integrated RTD units shall be conducted at the manufacturer's facilities. The manufacturer shall provide Factory Acceptance Test (FAT) documentation that shall accompany each RTD unit upon delivery.
- f. See "Conduit and Wiring", "Fiber Optic Cable" and "Communications Equipment" for additional information regarding power and communications for the real-time displays.
- g. Anchors and Inserts: Provide stainless steel anchorages. Refer to Design Plans for specific anchors.
- h. Fabricate signs to comply with requirements indicated for materials, thickness, finishes, colors, designs, shapes, sizes and details of construction as shown on the Contract Documents, Design Plans and these Technical Specifications.
- i. All signs must comply with ADA requirements for placement, clearances and text height.
- j. Insofar as practicable, fabrication, assembly and fitting of the work shall be executed in the shop with the various parts or assemblies ready for installation at the site.
- k. Work that cannot be shop assembled shall be given a trial fit at the shop to assure proper and expeditious field assembly.
- l. All fabricated sign joints, corners, miters, etc., shall be accurately machined, filed and fitted, and rigidly framed together at joints and contact points.
- m. All work shall be carefully matched to produce a perfect continuity of lines and design. Materials in contact shall have hairline joints, unless otherwise shown on the drawings, and shall be painted smooth to give a monolithic appearance. All mechanical fasteners shall match color and finish of the sign area where they occur.
- n. Concealed surfaces to be in contact with concrete or dissimilar metals shall have an applied heavy coating of bituminous paint.
- o. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within tolerances specified for the particular product.
- p. All removable members shall be carefully machined and fitted and shall be secured by mechanical fasteners of proper size and approved spacing.
- q. The Contractor, when applicable, shall incorporate the latest proven technological achievements in the field of sign manufacturing to achieve maximum service life and superior attractiveness of appearance.

3. Materials

- a. The screen (sign) shall meet the following minimum specifications:
 - i. Minimum size: 45" diagonal (active display area)
 - ii. Viewing Angles (Horizontal/Vertical): 178 degrees/178 degrees
 - iii. Minimum colors: 16 million
 - iv. Minimum resolution: 1920 x 1080
 - v. Contrast Ratio: 2000:1
 - vi. Brightness levels:
 - i. Indoor installations = 450 cd/m² (candelas per square meter)
 - ii. Outdoor installations = 600 cd/m²

- vii. Ability to be positioned with tilt toward the ground (up to 15 degrees from vertical axis)
- b. The sign controller (computer) shall meet the following minimum specifications:
 - i. CPU: 2.5GHz dual core or similar
 - ii. Memory: 4GB RAM
 - iii. Ethernet: 10/100 Base-T network interface card (10/100/1000 Base-T optional)
 - iv. Connectors: EIA-232 (2 ports), USB 3.0 (2 ports)
 - v. Keyboard/mouse: USB
 - vi. Operating temperature: -10 to +50 degrees Celsius (+14 to +122 degrees Fahrenheit)
 - vii. Humidity Operation: 5~90% non-condensing
 - viii. Hardware Drive: 50GB

The sign controller should include a standard port to connect to the proposed display monitor

Any deviations from these display and sign controller specifications shall be submitted in writing to the MTC Contract Manager or designee for consideration and approval, *prior to ordering the assembly.*

- c. The sign controller shall be provided with a remote reboot feature where the controller can be re-booted from a remote location when network communications is established.
- d. The sign controller shall be provided with an environmental sensor that is able to monitor the temperature and humidity of the sign enclosure.
- e. It shall be the Contractor's responsibility to seek MTC consideration and approval in writing for any RTD that does not meet these minimum specifications. Contractor shall be responsible for any and all costs associated with the RTD procurement should a proposed RTD be rejected due to failure to meet the minimum specifications should the Contractor provide the submittals to MTC after the unit(s) have been ordered or delivered, no exceptions.
- f. The sign enclosure (housing) shall consist of the following specifications:
 - i. The screen and sign controller shall be contained in a single stainless steel housing and anti-glare reflective protection for the screen.
 - ii. The housing shall meet the following minimum specifications:
 - a) Integrated 120V power source for both screen and sign controller. If power source is not within 5 feet of the screen and sign controller, an in-line cut-off (disconnect) switch shall be furnished and installed.
 - b) Stainless steel shall conform to material requirements as described in Section D, Transit Information Displays.
 - c) At all locations, the RTD enclosures shall be IP65-rated for exterior installations (outdoor-rated). These enclosures shall have Air Conditioning (AC) units to maintain proper operating temperature for the real-time display sign and controller.
 - d) At all locations, the RTD enclosures shall incorporate anti-theft security features. All nuts and bolts for attaching mounting bar to TID poles and for attaching sign enclosure to mounting bar or walls shall be stainless steel tamperproof security fasteners (Slot-Lok® or approved equivalent). A minimum of two wrenches for nut and bolt removal shall be supplied for each sign enclosure.

4. Fabrication

- a. Fabrication shall be clean and true and in accordance with applicable National codes and specifications. All contact surfaces, whether bolted or welded, shall be checked for true plane faces and the absence of burns or other obstructions to snug fits.

- b. Factory-assemble units and apply finishes and graphics in accordance with manufacturer's standards and approved shop drawings.
- c. Apply acrylic enamel and anti-graffiti finish. Apply anti-graffiti for the top coat.
- d. Prepare metal surfaces for finishing according to manufacturer's process specifications.
- e. Apply non-reflective vinyl graphics per project Sign Schedule and/or shop drawings.
- f. Weld internal separation plates and pipes to frame extrusions to assure rigid structure.
- g. Install end plate using self-threading screws in bosses provided in frame extrusion.
- h. Secure face panels to frame with continuous stainless steel piano hinge, or as recommended or fabricated by the manufacturer.
- i. Install stainless steel lock mechanisms.
- j. Install gasketing as required to eliminate water entry inside RTD cabinet.
- k. Install welded stainless steel base plate and bolted cross beam members per drawing details.
- l. Methods
 - i. All work in shop and field shall be carefully laid out.
 - ii. Field measure in the field to assure a fit and avoid immovable obstructions.
 - iii. Sign structures shall be true vertical and properly aligned.
- m. Grouting supplied and installed by the Contractor.
- n. Where galvanized steel is called for on the Contract or these Technical Specifications, it shall be hot-dip galvanized.
- o. Shop painting shall be done in accordance with Section 3.06 Finishes – Organic Coatings.
- p. Where specified in the Design Plans that the RTD shall be painted, the paint shall be Matthews Acrylic Polyurethane, or equal. Multi-component opaque paint material consisting of pigmented base and activator. UV resistant, satin sheen. Use primer and undercoats as recommended in writing by paint manufacturer for specific substrate.
- q. All abrasions and field welds shall be given a "touch-up" coating using the same paints used in the shop.

5. Artwork

There shall be no artwork supplied or installed for the real-time display.

6. Preparation and Installation

- a. The Contractor shall inspect all location, surfaces, and other works previously installed by others and promptly report to the MTC Contract Manager or designee any conditions that might impair the durability or appearance of his work.
- b. Contractor shall make himself familiar with the Contract Documents, Design Plans and these Technical Specifications and shall provide all real-time displays required as shown on the Contract Documents, Design Plans and these Technical Specifications. The Contractor shall thoroughly examine the Contract Documents, Design Plans and these Technical Specifications, carefully checking the dimensions before commencing work, and shall report any discrepancy that occurs, and shall request interpretation before proceeding with the work.
- c. Should there be conflicts or contradictions between these Technical Specifications and the Design Plans, these Technical Specifications shall take precedence and prevail over the

Design Plans. However, in the case where the Design Plans provide more explicit detail than these Technical Specifications, the Design Plans shall prevail. In all cases, should there be any differences in requirements between these Technical Specifications and the Design Plans, the more stringent requirements shall apply.

- d. Where special job conditions occur, or where there is uncertainty as to interpretation, before execution of the work, contractor shall inform the MTC Contract Manager or designee for clarification and information.
- e. Contractors shall make complete on-site measurements before commencing fabrication. Dimensions shall not be determined by scale or rule, and final fabrication measurements shall not be made from graphic scale layouts, which functions as guides only.
- f. Deliver all signage and graphics products and materials in protective wrapping and store protected from weather, moisture and soiling.
- g. All signs are to be cleaned after installation to remove all smears, smudges, dust, dirt or other surface obscurations. If sign had a temporary cover, cleaning will be required to remove dust and dirt from the sign surface where the cover is removed. Cover to be disposed of properly off site.
- h. All painted surfaces of signs to be restored to factory shipped conditions using a fabricator provided touch up paint or other specified process that is acceptable to the MTC Contract Manager or designee, for all areas needing touch up, or if colors are light or rubbed off due to shipping or installation.
- i. Contractor shall assume full liability, with regard to damages and losses as a result of incorrect and/or insufficient sign fabrication and installation.
- j. The Contractor shall assume the responsibility for the location of concealed post-tensioned cables in concrete before drilling for concrete anchors, with positive detection devices.
- k. Install the work plumb, level and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 8 feet-0 inches for plumb and level with maximum 1/32 inch offset in flush adjoining structural, free from distortion or other defects of appearance.
- l. The Contractor will coordinate with the MTC Contract Manager or designee, and will allow for an appropriate area for all deliveries to be assembled for inspection prior to installation. The Contractor will provide time in scheduling a job for sufficient time to allow for corrections and repairs to be completed at job site before installation if needed.
- m. In general, the signs shown on the Sign Location Plans are located schematically. The Contractor shall notify the MTC Contract Manager or designee of any location or installation modification changes from those indicated on the Sign Location Plans and gain approval before installation.
- n. The Contractor shall layout, measure, and mark each sign location by sign identification code for review and approval before proceeding with installation.
- o. The Contractor shall lay out all the work and make all surveys necessary for the satisfactory completion of the work in accordance with the Design Plans and these Technical Specifications. The Contractor shall be responsible for all measurements required for the execution of the work.
- p. The Contractor shall furnish, at his expense, such templates, platforms, equipment, tools, and materials, and all labor as may be required in layout of any part of the work shown on the Contract Documents, Design Plans and these Technical Specifications. It shall be the responsibility of the Contractor to maintain and preserve all marks established until authorized to remove them, and if such marks are destroyed by the Contractor or through

his negligence, prior to their authorized removal, the Contractor shall promptly replace them. The MTC shall require that work be suspended at any time when survey marks established by the Contractor are not reasonably adequate to permit satisfactory prosecution and control of the work.

- q. The Contractor shall provide competent and experienced personnel for all layout work. All survey and layout performed by the Contractor will be subject to verification.
- r. Unless designated otherwise by the Contract Documents, Design Plans and these Technical Specifications all salvageable materials and equipment shall remain the property of the MTC Contract Manager or designee or the Hub Project Manager. Material and equipment not retained by the MTC Contract Manager or designee shall become the property of the Contractor and shall be removed from the site by the Contractor.
- s. All debris shall be removed daily from the site by the Contractor and disposed of in a legal manner. No vending of materials is permitted on project site.

7. Cleaning and Protection

- a. Clean exposed surfaces in accordance with manufacturer's instructions.
- b. Protect exposed surfaces from damage by subsequent construction.

8. Remote Monitoring Software

- a. *The Contractor will utilize Owner-furnished license of LogMeIn for remote monitoring and trouble-shooting of the RTD. This software shall be used for remote access from workstation to trouble-shooting communications link and RTD unit, including remote controller configuration.*
- b. *The Contractor shall furnish and install LogMeIn on Agency workstation and configure to automatically send error messages to test email account when power or communications is lost to the RTD unit.*

9. Submittals

- a. Shop Drawings: Refer to Section G of these Technical Specifications for more detail on the requirements of the shop drawings.
 - i. Show fabrication and installation details for signs, controller, cables, mountings, housing, conduits, pullboxes, and mounting devices including any mounting crossbars.
 - ii. Submit data sheets for all electronic units that are part of the real-time display assembly including all communications equipment, peripherals and connections.
 - iii. Submit manufacturer's written certification of the IP rating of the RTD enclosure.
- b. Samples: Submit the following samples for verification:
 - i. Corner of housing frame
 - ii. Mounting assembly for the RTD for pole and wall mountings.

10. RTD Testing, Configuration and Setup

- a. Factory Quality Assurance
 - i. Contractor shall complete Factory Quality Assurance Testing of the manufactured units. These written results shall be furnished to the MTC Contract Manager results of prior to Pre-installation Test
- b. Pre-installation Test
 - i. Prior to delivering RTD to project site, Contractor shall complete a pre-installation test to verify proper configuration and operations of the RTD units.

- ii. Pre-installation shall be viewed in person MTC Contract Manager. If travel outside the nine-county San Francisco Bay Area is necessary, the Contractor shall budget and pay to accommodate three (3) MTC Contract Manager representatives including all reasonable costs for travel (airfare, car rental, taxis, public transit, parking, etc.), meals (\$66 per person per day), hotel, and other expenses. Travel arrangements will be made by MTC Contract Manager Representatives, and reimbursed by Contractor within 30 days of invoice submittal. MTC shall incur no costs for viewing configuration tests outside the Bay Area. Should multiple trips be necessary before approval is given, budget should be structured accordingly. Alternatively, at the approval of the MTC Contract Manager, Factory-approved RTD units may be shipped to a local nine-county San Francisco Bay Area location for the Pre-Installation Test.
- iii. The Contractor shall conduct the pre-installation testing of each RTD using the test guidelines as described in this section and the latest Regional Real-Time Signs, Physical Requirements and Specifications (Version 5.0).
- iv. The Contractor shall take these test guidelines and develop detailed test plans and procedures to be approved by the MTC Contract Manager or designee.
- v. Pre-installation test plans shall be submitted a minimum of one week prior to configuration test.
- vi. As a minimum, the pre-installation test shall include the following:
 - 1. Connect RTD units to a local test network (with internet access to the MTC test messages). Test network will include a workstation with remote monitoring software.
 - 2. Verify that all popups, screen savers and any other automated scripts are turned off on the RTD unit.
 - 3. When the website is displayed on the screen, it shall be displayed in full screen view, i.e., there shall be no visible borders or other information displayed on the screen other than that generated by the website.
 - 4. The display screen shall be able to automatically transition to "screen saver" mode when there is no activity on the website, and shall be able to automatically transition out of "screen saver" mode without any manual intervention when activity on the website resumes.
 - 5. Launch the internet browser on each RTD unit and enter the URL provided by 511 for use with the specific sign being tested.
 - 6. Confirm that the RTD unit is displaying the correct webpage for the specific hub site.
 - 7. Demonstrate automatic sending of error messages to test email account by workstation when power or communications is lost to the RTD unit.
 - 8. Demonstrate remote access from workstation to trouble-shooting communications link and RTD unit, including remote controller configuration.
- vii. The RTD units shall pass the pre-installation test and written results shall be submitted to the MTC Contract Manager prior to shipping the RTD units to the project site.

- a. Project Site Configuration and Testing
 - i. Contractor shall coordinate with the Hub Project Manager on the procurement and installation of a new Internet connection within the MPOE as designated on the Design Plans
 - ii. Where noted on the Design Plans to use an existing Internet connection, Contractor shall coordinate with the Hub Project Manager to provide and configure the required equipment and cabling as shown in the Design Plans to establish communications between the existing Internet access point and each real-time display that will use the existing Internet connection.
 - iii. The display computer shall be configured by the Contractor to retrieve the contents of a website designated by the MTC Contract Manager or designee.
 - iv. Contractor shall notify the MTC Contract Manager or designee at least three (3) weeks prior to the testing of the RTD. This will enable the MTC Contract Manager to start the process of attaining the URL for the 511 website.
 - v. The URL for the website will be provided by the MTC Contract Manager after the three (3) week notification period by the Contractor that the RTD will be tested.
 - vi. Upon receipt of the URL by the Contractor, the Contractor shall be responsible for configuring the browser to access the URL, retrieve its contents, display the contents on the display screen and maintain the website display contents.
 - vii. After installation, Contractor shall perform the same test procedures as in the "Pre-installation test"

11. Measurement and Payment

Separate measurement and payment will not be made for work required under this Section. All costs in connection with the work specified herein will be considered to be included with the related item of work in the Bid Schedule of the Bid Form, or incidental to the Work.

C. SECTION NOT USED

D. CONDUIT AND WIRING

1. Description

Contractor shall furnish and install conduit and wiring as necessary to provide power and communications connections for complete and functioning real-time display system. Conduits shall be metal or non-metallic type and installed in buildings, attached to structures, into cabinets, into service cabinets and into existing and new pull boxes located in concrete walkways. Contractor shall install circuit breakers, in-line cutoff (disconnect) switches, pull boxes and duplex receptacles. Refer to the Design Plans for conduit routing and conductor types.

2. General

All conduits, pull boxes, and wiring shall conform with Caltrans Standard Specifications and Standard Plans (May 2006), the latest version of the National Electrical Code (NEC) and the latest version of the National Electrical Safety Code (NESC).

3. Materials

- a. All exposed conduits and all conduits entering Transit Information Display (TID) structure poles shall be galvanized rigid steel. All other conduits shall be Schedule 80 PVC.
- b. Circuit breakers shall meet the following minimum specifications:
 - i. UL-listed
 - ii. Single pole, sized as per Design Plans
- c. In-line cutoff (disconnect) switches shall meet the following minimum specifications:
 - i. Manually operated switch
 - ii. 25A rating
 - iii. Weatherproof
 - iv. UL-listed (outdoor-rating)
 - v. Lockable with locks provided by Contractor, or use agency-furnished pad-lock, at MTC Contract Manager or his designee's discretion.
 - vi. Mounting options to include rear pole mounting, cabinet mounting, and DIN rail mounting.
- d. Duplex receptacles shall meet the following minimum specifications
 - i. UL-listed (outdoor-rating)
 - ii. Lockable with locks provided by Contractor, or use agency-furnished pad-lock, at MTC Contract Manager or his designee's discretion

4. Fabrication

- a. Fabrication shall be clean and true and in accordance with applicable National codes and specifications. All contact surfaces, whether bolted or welded, shall be checked for true plane faces and the absence of burns or other obstructions to snug fits.
- b. Methods
 - i. All work in shop and field shall be carefully laid out.
 - ii. Field measure in the field to assure a fit and avoid immovable obstructions
 - iii. Sign structures shall be true vertical and properly aligned.
- c. Grouting supplied and installed by the Contractor.
- d. All abrasions and field welds shall be given a "touch-up" coating using the same paints used in the shop.

5. Artwork

Not applicable

6. Preparation and Installation

- a. The Contractor shall inspect all location, surfaces, and other works previously installed by others and promptly report to the MTC Contract Manager or designee any conditions that might impair the durability or appearance of his work.
- b. Contractor shall make himself familiar with the Contract Documents, Design Plans and these Technical Specifications and shall provide all real-time displays required as shown on the Contract Documents, Design Plans and these Technical Specifications. The Contractor shall thoroughly examine the Contract Documents, Design Plans and these Technical Specifications, carefully checking the dimensions before commencing work, and shall report any discrepancy that occurs, and shall request interpretation before proceeding with the work.

- c. Should there be conflicts or contradictions between these Technical Specifications and the Design Plans, these Technical Specifications shall take precedence and prevail over the Design Plans. However, in the case where the Design Plans provide more explicit detail than these Technical Specifications, the Design Plans shall prevail. In all cases, should there be any differences in requirements between these Technical Specifications and the Design Plans, the more stringent requirements shall apply.
- d. Where special job conditions occur, or where there is uncertainty as to interpretation, before execution of the work, contractor shall inform the MTC Contract Manager or designee for clarification and information. Contractors shall make complete on-site measurements before commencing fabrication. Dimensions shall not be determined by scale or rule, and final fabrication measurements shall not be made from graphic scale layouts, which functions as guides only.
- e. Wiring shall conform with latest National Electrical Code.
- f. If conductors are shown to be spliced in pullboxes, they shall be spliced using method described in the latest Caltrans Standard Specifications.
- g. All conductors shall be permanently labeled and identified in each and every pullbox.
- h. Concrete impacted by installation of pull boxes and conduit shall be removed from existing scoreline to existing scoreline at 5" depth (min). Replacement concrete shall conform in materials, thickness, depth and appearance to the existing concrete.

7. *Cleaning and Protection*

- a. Clean exposed surfaces in accordance with manufacturer's instructions.
- b. Protect exposed surfaces from damage by subsequent construction.

8. *Submittals*

- a. Shop Drawings:
 - i. Show fabrication and installation details for materials including proposed mounting equipment.

9. *Measurement and Payment*

- a. Separate measurement and payment will not be made for work required under this Section. All costs in connection with the work specified herein will be considered to be included with the related item of work in the Bid Schedule of the Bid Form, or incidental to the Work.

E. SECTION NOT USED

F. TRAINING -

The Contactor shall conduct a hands-on training session for the operations and troubleshooting of the real-time display assemblies, and their associated communications equipment. The purpose of the training is to provide the Hub Owners and their support and maintenance staff the knowledge to be able to conduct operations and maintenance of the real-time display system elements described here in these technical specifications. It is a requirement that the training to be provided shall be tailored specifically on the operations and maintenance activities of each of the hardware and software units of the real-time display assemblies and communications equipment such that the Hub Owners and their support staff are able to properly and effectively

monitor, manage and make any configuration changes as necessary over the course of operating the real-time display system.

The Contractor shall coordinate, organize, and conduct one half-day hands-on training session that walks through the installation process, off-the-shelf software requirements, hardware minimal and optimal requirements for the system, and all operator and system administrator functions of the real-time display system and communications equipment. The training shall be conducted for up to 6 attendees at a facility to be designated by the MTC Contractor Manager or his designee. The Contractor shall be responsible for coordination and providing all equipment needed for the training session.

1. *Measurement and Payment*

Separate measurement and payment will not be made for work required under this Section. All costs in connection with the work specified herein will be considered to be included with the related item of work in the Bid Schedule of the Bid Form, or incidental to the Work.