

Special Specification 6033

Computerized Transportation Management System



1. DESCRIPTION

Relocate computerized transportation management system (CTMS) equipment as shown on the plans and as described in this specification.

2. RELOCATING CLOSED CIRCUIT TELEVISION (CCTV) EQUIPMENT

Assume responsibility for relocating existing CCTV equipment as shown on the plans. The relocation at a CCTV location includes but is not limited to:

- Camera pole structures
- Controller cabinets
- CCTV cameras, lenses and peripherals
- Transmission and communications equipment
- Cabling

Provide CCTV system testing before and after relocation. Submit detailed test procedures to the Engineer for approval before testing. Perform the tests and report the results to the Engineer before removing the CCTV equipment. Perform the tests again after completing the relocation. Ensure the test results after relocation are equal to or better than the test results before relocation. The test consists of functional testing of the video signal and mechanical functions of the CCTV system. As a minimum, the test parameters include the following functions:

- Camera on/off
- Zoom in
- Zoom out
- Focus near
- Focus far
- Iris manual override
- Iris open
- Iris close
- All presets

As a minimum, test the following video signal parameters:

- White Level (100% IRE)
- Black Level (7.5 IRE)
- Average Picture Level-Daylight (80% IRE)
- Iris manual override
- Iris open
- Iris close
- All presets

Measure the video signal parameters at the output of the video fiber optic receiver and at the output of the equalization amplifier in the Satellite Building. Perform the tests using a calibrated waveform monitor.

Remove the CCTV equipment carefully from the original location and move it to the proposed location as shown on the plans. Install the CCTV equipment so that the adjacent freeway lanes are centered in the pan-

tilt travel area of the equipment. Install the necessary foundations, conduit, control cables, power cables, communications cables, fiber optic cables, coaxial cables, transmission equipment, power services, and other necessary equipment as required for a completely operational CCTV installation. Reconnect the CCTV equipment to the existing communications network and make it fully operational.

Assume responsibility for the CCTV equipment and cabling during the relocation. Replace any equipment damaged during the relocation with new equipment identical to that which was damaged, at no cost to the Department.

3. RELOCATING HURRICANE EVACUATION CAMERA (HEC) EQUIPMENT

Assume responsibility for relocating existing HEC equipment as shown on the plans. The relocation at a HEC location includes but is not limited to:

- Controller cabinets
- Hurricane Evacuation camera, lenses, and peripherals
- Mounting hardware
- Mounting hardware
- Transmission and communications equipment
- Cabling

Provide HEC system testing before and after relocation. Submit detailed test procedures to the Engineer for approval before testing. Perform the tests and provide a report of the results to the Engineer before removing of HEC equipment. Perform the tests again after completing the relocation. Ensure the test results after relocation are equal to or better than the test results before relocation. The test consists of functional testing of the video signal and mechanical functions of the HEC system. As a minimum, the test parameters include the following functions:

- Camera on/off
- Zoom in
- Zoom out
- Focus near
- Focus far
- Motion JPEG/MPEG-4 video signal output
- Pan left/right
- Tilt up/down
- All presets

Remove the HEC equipment carefully from the original location and move it to the proposed location as shown on the plans. Install the HEC equipment so that the adjacent freeway lanes are centered in the pan-tilt travel area of the equipment.

Install the necessary conduits, cables, transmission equipment, power services, and other necessary equipment as required for a completely operational HEC installation. Reconnect the HEC equipment to the communications network and make it fully operational.

Assume responsibility for the HEC equipment and cabling during the relocation. Replace any equipment damaged during the relocation with new equipment identical to that which was damaged, at no cost to the Department.

4. RELOCATING THE COMMUNICATION HUB BUILDING

Relocate the existing communications hub building and equipment as shown on the plans.

This relocation includes but is not limited to:

- Communications hub buildings
- Communications equipment
- Equipment racks
- Cabling

Remove the communications hub building and associated equipment carefully from the original location and move it to the proposed location as shown on the plans. Install the necessary foundations, conduit, communications cables, power cables, fiber optic cables, control cables, signal cables, power services, and other necessary equipment as required for a complete communications hub building installation. Reconnect the communications equipment and cabling and reestablish complete functionality of the communications hub building and equipment.

As a minimum, assume responsibility for performing the following tests on the communications networks.

- 4.1. **Pre-Installation Bit Error Rate Test.** Examine the existing composite T-1 span of the link(s) to be relocated. Perform the test utilizing a T-BERD or TTS-3 T-1 span test analyzer. Connect the equipment to the line interface unit monitor bantam jack and monitor the status of the T-1 span. Record the bit error rate and report it to the Engineer.
- 4.2. **Post-Installation Bit Error Rate Test.** Upon completing the pre-installation bit error rate test and recording and reporting the test results, the Contractor may proceed to disconnect the tested T-1 link(s) and perform the relocation.

After completing the relocation and establishing the new T-1 link(s), perform a post installation bit error rate test. Ensure the bit error rate measure in the post installation test is equal to or better than the pre-installation bit error rate.

Perform a separate bit error rate test on each T-1 link affected by the relocation.

Furnish the test equipment required for performing the tests. Provide the test result forms to the Engineer for each of the tests.

Submit a detailed test procedure for each of the tests to the Engineer for approval before performing the tests.

Notify the Engineer a minimum of 30 days before performing each test.

Relocate the communications hub building and associated equipment and cabling as shown on the plans. Replace any equipment damaged during the relocation with new equipment identical to that which was damaged, at no cost to the Department.

5. RELOCATING DYNAMIC MESSAGE SIGNS

Relocate existing Dynamic Message Signs (DMS) and equipment as shown on the plans.

This relocation includes but is not limited to:

- Dynamic message signs
- Communications equipment
- Sign structures
- Cabling
- Controller cabinets
- Flashing beacons

Remove the DMS equipment carefully from the original location and move it to the proposed location as shown on the plans. Orient the sign so that it faces approaching traffic on the adjacent freeway main lanes unless directed otherwise by the Engineer. Install the necessary foundations, conduit, control cables, power cables, communications cables, telephone cables, communications equipment, telephone services, power services, and other necessary equipment as required for a completely operational DMS installation. Reconnect the DMS equipment to the communications network and make it fully operational.

Test the performance of the DMS for operation before relocating. Upon completing the relocation, retest the performance of the DMS. Ensure the performance test results after relocation is equal to or better than the test results before relocation.

Relocate the DMS equipment, sign structure, and cabling as shown on the plans. Replace any equipment damaged during the relocation with new equipment identical to that which was damaged, at no cost to the Department.

6. RELOCATING VIDEO IMAGE VEHICLE DETECTION SYSTEM EQUIPMENT

Relocate the existing Video Image Vehicle Detection System (VIVDS) equipment as shown on the plans.

This relocation includes but is not limited to:

- VIVDS support poles
- Communications equipment
- Sensor units
- Cabling
- Automatic control units (ACU)
- Detection zone programming and calibration

Remove the VIVDS equipment carefully from the original location and move it to the proposed location as shown on the plans. Orient the VIVDS equipment as required, locating the VIVDS detection zones as shown on the plans. Provide the equipment necessary for programming the ACU and for placement of the detection zones. Install the necessary foundations, conduit, cables, transmission equipment, power services, and other necessary equipment as required for a completely operational VIVDS installation. Reconnect the VIVDS equipment to the communications network and make it fully operational.

Test the performance of the existing VIVDS equipment for speed, volume, and occupancy before relocation begins. Use the test to determine the accuracy of the VIVDS before relocation. Measure the accuracy for each zone of each sensor unit.

Upon completion of the VIVDS relocation, establish detection zones for each relocated VIVDS sensor unit. Program the ACU so that each sensor unit has 2 detection zones in each travel lane unless directed otherwise by the Engineer. Calibrate the detection zones.

After completing the detection zone establishment, test the performance of the VIVDS equipment. Ensure the tests performed after relocation are identical to the tests performed before the relocation. Perform the tests for each detection zone of each sensor unit. Ensure the test results for VIVDS equipment after relocation is equal to or better than the test results before relocation.

Relocate the VIVDS equipment and cabling as shown on the plans. Replace any equipment damaged during the relocation with new equipment identical to that which was damaged at no cost to the Department.

7. RELOCATING RAMP METERING EQUIPMENT

Relocate the existing ramp metering equipment as shown on the plans.

This relocation includes but is not limited to:

- Ramp meter signal assemblies
- Communications equipment
- Controller cabinets
- Cabling

Remove the ramp metering equipment carefully from the original location and move it to the proposed location as shown on the plans. Unless directed otherwise by the Engineer, remove existing pavement markings associated with the ramp meter equipment. Orient each signal assembly so that it faces approaching traffic on the adjacent freeway entrance ramp and frontage road unless directed otherwise by the Engineer. Install the necessary foundations, conduit, cables, power services, pavement markings, and other necessary equipment as required for a completely operational ramp metering installation. Reconnect the ramp metering equipment to the communications network and make it fully operational.

Relocate the ramp metering equipment and cabling. Replace any equipment damaged during the relocation with new equipment identical to that which was damaged, at no cost to the Department.

8. RELOCATING ELECTRICAL CONDUCTORS

Perform the reinstallation or installation of the electrical conductors in accordance with the latest revision of the NESC and NEC codes. Inspect the conductors visually for insulation condition before relocation to another site. If the cable has been chafed or damaged otherwise causing insulation failure, notify the Engineer for replacement. Assume responsibility for the complete rerouting of the electrical conductors. Reinstall the electrical conductors back to their original configuration. Perform pre-removal inspection and test. Coordinate with Department's representative before removing of any conductors. After removal of existing conductors, perform the following tests:

- Inspect for physical damage to cable.
- Check for uniform jacket thickness and tightness of the jacket.
- Perform continuity test (under direct supervision of the Engineer).

Replace any conductors or electronic equipment damaged during re-powering or reconnection of service, at no cost to the Department.

After reinstallation of electrical conductors perform the following tests as a minimum:

- Ground resistance measurements
- Conductor continuity
- DC insulation resistance measurements

Perform field-testing under the supervision of the Engineer. Provide the test equipment necessary for testing the reinstalled conductors.

9. RELOCATING FIBER OPTIC CABLE

Before starting any work involving the existing fiber optic cable, completely identify the fiber strands currently in use and do not disconnect any active fiber without coordination with the Department's representative. Furnish the material and services necessary for disconnection and reconnection of existing equipment to the fiber optic cable as part of this bid item. Repair any damage to the existing fiber optic cable or patch panels during the reconnection of existing equipment, at no cost to the Department.

Document all changes in the fiber optic cable utilization and provide detailed fiber optic cable as-built schematics to the Engineer upon completion of the changes. Provide complete documentation for all temporary and permanent installations.

Provide fiber optic cable with refractive indexes and core alignment fully compatible with the existing glass fiber for minimum splice losses.

Provide a cable configuration that matches the existing fiber optic cable. If the work requires pulling the cable from an existing conduit and rethreading the cable for the new installation, the cable must be undamaged. No splices will be allowed between cabinets.

Splice or terminate each strand of every relocated fiber optic cable unless shown otherwise in the plans. Use splice enclosures, organizers and incidentals, and cable end preparation tools and procedures that are approved by the Engineer. Test all splices and terminations to the satisfaction of the Engineer. Return cable, buffer, and bare fiber spare lengths to their original state or better.

Use the Optical Time Domain Reflectometer (OTDR) to measure the fiber optic cable for overall attenuation (signal loss dB/km), fiber cable length, and to identify fiber cable anomalies such as breaks in the cable. Perform the four OTDR tests as follows:

- Test the existing cable before rerouting.
- Post-install test of rerouted cable.
- Documented splice loss test.
- Final end to end OTDR test.

Perform OTDR tests bi-directionally at dual windows at medium settings for each strand of the relocated cable. Record the test results on portable media, with copies of the media and paper copy delivered to the Engineer for approval. Final inspection and acceptance of the fiber optic cable will be made after the completion of the installation and testing and approval of the documentation. Provide the software necessary for viewing the test results.

10. RELOCATING COMMUNICATION CABLE

Ensure the reinstallation or installation of the communication cable is in accordance with the latest revision of the NESC and NEC codes. Assume responsibility for the complete rerouting of the communication cable. Reinstall the communication cable back to original configuration. Perform the pre-removal inspection and test. Coordinate with the Department's representative before removing any communication cable. Perform the following tests after removal of existing communication cable:

- Inspect for physical damage to cable.
- Check for uniform jacket thickness and tightness of the jacket.
- Under direct supervision of the Engineer, perform a continuity test for cable and wire shield.

Replace any existing communication cable or electronic interfaces damaged during reconnection, at no cost to the Department.

After reinstalling the communication cable, perform the following tests as a minimum:

- Ground resistance measurements
- DC loop resistance measurements
- Shield continuity
- DC insulation resistance measurements
- Conductor continuity
- Insertion loss measurements.

Perform field-testing under the supervision of the Engineer. Provide the test equipment necessary for testing the reinstalled or installed cable.

11. RELOCATING MICROWAVE VEHICLE DETECTION EQUIPMENT

Relocate the existing microwave vehicle detection (MVD) equipment as shown on the plans.

Provide MVD system testing before and after relocation. Submit detailed test procedures to the Engineer for approval before testing. Perform the tests and report the results to the Engineer before removing the MVD equipment. Perform the tests again after completing the relocation. Ensure the test results after relocation are equal to or better than the test results before relocation. The test consists of functional testing of the vehicle sensing accuracy across all lanes and data communications.

Remove the MVD equipment carefully from the original location and move it to the proposed location as shown on the plans. Store the equipment in a safe and secure area if immediate reinstallation is prevented by construction phasing. The Contractor is fully responsible for the equipment until released by the Engineer. All materials not designated for reuse or retention by the State will become the property of the Contractor and be removed from the project site at the Contractor's expense.

Install the MVD equipment so that the adjacent freeway lanes can be accurately covered by the MVD sensors taking into account manufacturer recommendations for travel lane offsets and sensor mounting height. Install the necessary foundations, conduit, control cables, power cables, communications cables, fiber optic cables, coaxial cables, transmission equipment, power services, and other necessary equipment as required for a completely operational MVD installation. Reconnect the MVD equipment to the communications network and make it fully operational.

Assume responsibility for the MVD equipment and cabling during the relocation. Replace any equipment damaged during the relocation with new equipment identical to that which was damaged, at no cost to the Department.

Recalibrate the relocated MVD equipment for the conditions at each site (number of lanes, speeds, etc.)

12. DOCUMENTATION

Provide each communications hub building, cabinet, or satellite control building affected by the relocation of equipment on this project with the following documentation:

- Three complete and accurate building/cabinet wiring diagrams.
- Document the wiring diagrams in every harness wire termination in the building/cabinet. If discrepancies are discovered in the drawings, update the drawings.
- Leave one set of wiring diagrams in the building/cabinet, deliver the other documentation to the Engineer.

13. MEASUREMENT

The Relocation of Closed Circuit Television (CCTV) Equipment will be measured as each CCTV location removed, relocated, installed, and made fully operational in accordance with the plans and specifications.

The Relocation of Hurricane Evacuation Camera (HEC) Equipment will be measured as each HEC location removed, relocated, installed, and made fully operational in accordance with the plans and specifications.

The Relocation of the Communications Hub Building will be measured as each Communications Hub Building removed, relocated, installed, and made fully operational in accordance with the plans and specifications.

The Relocation of Dynamic Message Signs (DMS) will be measured as each Dynamic Message Sign, associated controller, and communications equipment removed, relocated, installed, and made fully operational in accordance with the plans and specifications.

The Relocation of Video Image Vehicle Detection Equipment (VIVDS) will be measured as each VIVDS location removed, relocated, installed, and made fully operational in accordance with the plans and specifications. A VIVDS location is defined as an automatic control unit and its associated sensor units, fiber optic transmitters, and receivers, cables, mounting attachments, and hardware.

The Relocation of Ramp Metering Equipment will be measured as each complete ramp meter location removed, relocated, installed, and made fully operational in accordance with the plans and specifications.

The Relocation of Communication Cable will be measured by the linear foot of cable complete in place, installed, connected, and tested in accordance with these specifications. Removal of existing cable to be relocated is subsidiary to this Item.

The Relocation of Fiber Optic Cable will be measured by the linear foot of cable furnished, installed, spliced, connected, and tested in accordance with these specifications. Removal of existing cable to be relocated is subsidiary to this Item.

The Relocation of Electrical Conductor will be measured by the linear foot of cable complete in place, installed, connected, and tested in accordance with these specifications. Removal of existing cable to be relocated is subsidiary to this item.

The Relocation of Microwave Vehicle Detection Equipment will be measure by each complete MVD equipment station removed, relocated, installed, and made fully operation in accordance with the plans and specifications.

14.
PAYMENT

The work performed and materials furnished in accordance with the Item and measured as provided under "Measurement" will be paid at the unit price bid for "CTMS Relocation (CCTV)," "CTMS Relocation (HEC)," "CTMS Relocation (Hub Bldg.)," "CTMS Relocation (DMS)," "CTMS Relocation (VIVDS)," "CTMS Relocation (Ramp Meter)," "CTMS Relocation (Electrical Conductor Cable)," "CTMS Relocation (Fiber Optic Cable)," or "CTMS Relocation (Communication Cable)," or "MVD Relocation." This price is full compensation for the equipment described under this Item with cables and connectors; documentation and testing; and for furnishing the labor, tools, materials, equipment, and incidentals. MVD relocation includes installation of the pole mounted MVD equipment cabinet as described in the plan notes.