

ITEM 633 TRAFFIC SIGNAL CONTROLLERS

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633.01 Description. This work consists of furnishing and installing traffic signal control equipment, including controllers, cabinets, auxiliary equipment, and specified accessories, completely wired, at the locations shown on the plans and ready for service.

633.02 Contractor Personnel Requirements. Conform to the requirements of City Supplement 1063 for the installation or testing of traffic signal equipment.

633.03 Materials and Equipment. Furnish new materials and equipment of first quality, of current design, and free from defects.

Use electrical parts, wire, switches, and other elements of the installation capable of carrying the required current without excessive heating or drop of potential.

Ensure that each item of equipment bears a nameplate, indelible marking, or brand that identifies the type, model, catalog number, and manufacturer. Use equipment conforming to the types, models, and systems specified.

Furnish material and equipment conforming to:

Concrete	
(cabinet foundations and work pads).....	499, 511
Conduit.....	725.04, 725.051, 725.052
Controller unit.....	733.02
Cabinet and auxiliary equipment.....	733.03
Cabinet riser	733.04
Flasher controller	733.05
Controller, master, traffic responsive	733.06
Remote monitoring station	733.07
Telephone service.....	733.08
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633.04 Certified Drawings. Furnish certified drawings according to 625.06.

633.05 General. Ensure that major items of traffic signal control equipment used in combination are compatible, interchangeable, and, whenever feasible, provided by the same manufacturer or supplier.

Ensure that controller cabinets are shop prewired according to 632.05.

Provide four (4) sets of cabinet wiring schematics, two (2) service manuals and two (2) instructional manuals per cabinet at the time of cabinet delivery. Clearly note all deviations, changes, additions, or other modifications on the diagrams and manuals that are appropriate to reflect the exact equipment to be provided. Store copies of diagrams and manuals in a plastic envelope mounted horizontally and securely fastened to the inside of the main cabinet door. Position the envelope so that its opening is to the right or left and so it does not block any part of the air filter or the air intake located in the door.

Include in the service and instructional manuals sections covering the general description of equipment, equipment installation procedures, equipment programming procedures, theory of operation with system description including block diagrams, and detailed circuit diagrams, preventive maintenance, field trouble analysis, bench trouble analysis, troubleshooting analysis chart, wave forms, voltage measurements, voltage measurement charts, parts list, electrical interconnection drawings, schematic and logic diagrams, assembly drawings with pictorial diagrams showing physical locations and identification of each component.

Before beginning the 10-day performance test, replace or modify these documents as necessary to reflect current conditions. Upon completion of the work and performance test, replace and modify these documents as necessary. Transfer manufacturers' guarantees and warranties on all installed traffic signal control equipment to the City upon completion and acceptance of the project.

If required by the plans to install equipment furnished by others, store and care for the equipment upon receipt.

633.06 Testing and Prequalification. For all traffic control equipment, perform functional tests and a 10-day performance test according to 632.28. Do not clear conflict monitor logs during the 10-day test. Ensure that logs note power-up to start the test and all events until the test is complete. Restart the test upon correcting a noted event. Notify the Engineer at least 3 days before beginning the 10-day performance test. The Engineer will notify the maintaining agency of the beginning of the test. Ensure that the following testing and prequalification requirements are met:

A. For traffic control equipment required by this specification to meet NEMA Standards Publication TS-1 or TS-2, conform to the following:

1. Furnish a certified test report indicating compliance to all requirements of NEMA Standards Publication TS-1 or TS-2 as applicable.
2. Furnish the name and location of the laboratory testing facility as well as the identification of the principal personnel who conducted the equipment testing and a summary of their qualifications.
3. Ensure that the laboratory provides City representatives access to those parts of the laboratory where the testing was done.

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4. Upon request, furnish a copy of the actual test data results for review and analysis.

633.07 Controllers. Install controller units, consisting of the timing unit, software, and signal timing, into the specified type of prewired cabinet.

Program controller units as shown on the plans unless otherwise directed by the Engineer. If the plan timing data or the supplemental timing data supplied by the Engineer does not exactly fulfill the timing requirements of the installed equipment, notify, in writing, the Engineer of the problem and identify the discrepancies. The Engineer will consult with the maintaining agency and notify the Contractor within 2 weeks. After programming, briefly operate controllers, with the signals turned off by means of the signal shutdown switch, to ensure that operation is reasonable and conforms to the plans.

633.08 Cabinets. Mount cabinets by attaching to pedestal or pole or by installing on a concrete foundation. Arrange foundation mounted cabinets so that control equipment, terminal blocks, or shelves are no closer than 6 inches to the top of the foundation. Attach pole or pedestal mounted controller cabinets at a height that allows convenient access to all controller components by service personnel.

Make field connections for the conductors of signal cable, power cable, interconnect cable, and detector lead-in cable. Make the signal cable field connections according to 632.23. Neatly arrange and route all field wiring to the appropriate terminal blocks. Identify field wiring according to 725.02 except mark with either indelible pen or embossed letters.

Except for power wiring, fit field wiring entering the cabinet with spade terminals to ensure a good connection. For incoming power wiring, either use spade terminals or connect the bare conductor wire to terminal points utilizing screw or spring applied clamping surfaces compatible with either copper or aluminum wire and providing a positive grip. After completing field wiring, seal the conduit entering the cabinet in an approved manner with a removable sealing compound (no foam sealants), or a molded plastic or rubber device that is compatible with the cable jacket, the insulation, and the conduit material.

For foundation mounted cabinets, seal the joint between the controller cabinet and the foundation with a quality, clear silicone caulk.

When future phasing configurations are shown on the plans, furnish the cabinet and hardware to accommodate the future operation through only the future addition of load switches and detector units.

633.09 Cabinet Riser. Cabinet risers provide an extension of the cabinet between the ground mounted cabinet and the foundation. Bolt the riser to the foundation, and bolt the cabinet to the riser.

Use a type (size and shape) of cabinet riser compatible with the type of controller cabinets specified for the project.

Seal the joints between the controller cabinet and cabinet riser, and between the cabinet riser and foundation with a quality, clear silicone caulk.

633.10 Foundations. Construct foundations for controller cabinets according to 632.14, except that excavation by earth auger is not required and the foundation does not require reinforcing steel. Hold anchor bolts, conduit ells, and similar appurtenances in the proper position until the concrete has set. Pour foundations separately from controller work pad.

633.11 Controller Work Pad. Construct controller work pad according to 608.03, except that transverse joints are not required. The controller work pad shall be 48 inches wide x 36 inches deep x 4 inches high. Provide the top of the pad nominally 1 inch above ground line. If the controller cabinet has both front and back doors, install a work pad for each door. Pour controller work pad separately from foundations.

633.12 Flasher Controller. Furnish and install a flasher controller with cabinet and mounting hardware when indicated. The flasher controller is for the operation of flashing beacons.

633.13 Controller, Master, Traffic Responsive. The traffic responsive master controller supervises and controls the operation of an interconnected system of local controllers. Ensure that the master controller is able to communicate with a remote monitoring station. Locate this master controller in a local intersection controller cabinet unless otherwise shown on plans. If the local controller cabinet size is not sufficient to accommodate the master controller and its associated wiring, furnish the proper size cabinet for the local intersection controller to house the local controller, master controller, modem, and all auxiliary devices.

633.14 Remote Monitoring Station. Install, test, and operate the remote monitoring station, consisting of computer equipment, communications equipment, and software, in one or more locations in the facilities as shown on the plans. The City will furnish telephone service at these stations.

633.15 Telephone Service. Make arrangements with the local telephone company to have Centrex data communication telephone service furnished for the intersection cabinet locations shown on the plans. Activate the data communication telephone line within 7 days after the signal controller cabinet is functional and ready for system communication. Connect the data communication telephone line to the City of Columbus Centrex system. Maintain the telephone account until the signal system has been tested and accepted by the Engineer. After acceptance of the signal system, transfer the telephone account to the City. Obtain the billing address and billing number from the Division of Planning and Operations.

Make arrangements with the local telephone company to install an outside access box near the controller cabinet and telephone cable from the most convenient telephone junction box to the outside access box. Furnish and install a minimum size 2-inch conduit, twisted pair, shielded telephone cable, and conduit risers necessary to bring the telephone line from the outside access box into the controller cabinet. Furnish and install the modem and the lightning protection for the telephone lines in the controller cabinet.

633.16 Training. Furnish training for the traffic signal control equipment installed as part of the Contract. Furnish all handouts, manuals, and product information. For the training, use the same models of equipment furnished for the project. The City shall furnish the facilities in which the training will take place. Furnish all media and test

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equipment needed to present the training. Unless otherwise shown on the plans, the minimum training requirements are as follows:

- A. Sixteen hours on how to operate the system, analyze system performance, and revise critical operating parameters.
- B. Eight hours of field trouble-shooting and maintenance procedures.
- C. Eight hours of follow-up training after the City has operated the system for a minimum period of 30 days.
- D. Four hours for preemption device training if emergency vehicle preemption is shown on the plans.

633.18 Uninterruptible Power Supply (UPS). Furnish and install a Battery Backup UPS system to provide uninterruptible, reliable, emergency power to a traffic signal intersection in the event of a power failure or interruption. The transfer from utility power to battery power shall not interfere with the normal operations of the traffic controller, conflict monitor or any other peripheral devices within the traffic control system. The system shall be self-contained including all UPS hardware, the required number of batteries and its own separate ventilated enclosure.

633.19 Method of Measurement. The City will measure Controller Unit with Cabinet, # PH, *size, mounting type* by the number of each complete unit, and will include controller unit with software, all required auxiliary equipment, loop detector units, and a prewired cabinet, with all items completely wired and tested. Ground mounted cabinets will include anchor bolts and conduit ells for installation in the foundation. Pole mounted cabinets will include pole mounting hardware.

The City will measure Controller Unit by the number of each controller timing unit with software, and will include any signal timing programming or installation. The City will measure Controller Unit, Furnish Only by the number of each controller timing unit with software, and will exclude any signal timing programming or installation.

The City will measure Cabinet, # PH, *size, mounting type* by the number of each complete prewired cabinet installed, and will include all required auxiliary equipment and loop detector units (excluding controller unit), with all items completely wired and tested. Pole mounted cabinets will include pole mounting hardware. The City will measure Cabinet, # PH, *size, mounting type*, Furnish Only by the number of each complete prewired cabinet, and will include pole mounting hardware and anchor bolts, but will exclude installation, controller unit, and detector units.

The City will measure Cabinet Riser by the number of each unit, and will include materials, mounting hardware, and installation.

The City will measure Cabinet Foundation and Controller Work Pad by the number of each complete unit, in place, complete and accepted, and will include excavation, concrete, backfilling, and disposal of surplus excavation. Cabinet foundation will include anchor bolts and conduit ells for installation in the foundation and preformed joint filler between the foundation and adjacent paved areas.

The City will measure Flasher Controller by the number of each complete flasher assembly with cabinet installed and tested.

The City will measure Controller, Master, Traffic Responsive by the number of each unit, and will include installation, signal system software, programming, and any increase in cabinet size to house the master controller in the local intersection cabinet. The City will measure Controller, Master, Traffic Responsive, Furnish Only by the number of each unit, and will include software, but exclude any programming or installation.

The City will measure Remote Monitoring Station by the number of each location shown on the plans, and will include all equipment, testing, and software.

The City will measure Telephone Service by the number of each location shown on the plans for furnishing telephone service to an intersection controller, and will include the modem, lightning protection, outside access box, conduit riser, conduit, trenching, and wiring.

The City will measure Training on a lump sum basis, and will include providing the instruction materials, instructor travel expenses, and test or media equipment for presenting the training material.

The City will measure Uninterruptible Power Supply by the number of each and will include all equipment, testing and certifications.

633.20 Basis of Payment. The costs to obtain and maintain telephone service by the supply agency are included under Telephone Service.

The City will pay for accepted quantities at the contract unit prices as follows:

Item	Unit	Description
633	Each	Controller Unit with Cabinet, # PH, size, mounting type
633	Each	Controller Unit
633	Each	Controller Unit, Furnish Only
633	Each	Cabinet, # PH, size, mounting type
633	Each	Cabinet, # PH, size, mounting type, Furnish Only
633	Each	Cabinet Riser
633	Each	Cabinet Foundation
633	Each	Controller Work Pad
633	Each	Flasher Controller
633	Each	Controller, Master, Traffic Responsive
633	Each	Controller, Master, Traffic Responsive, Furnish Only
633	Each	Remote Monitoring Station
633	Each	Telephone Service
633	Lump	Training
633	Each	Uninterruptible Power Supply