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SPECIAL PROVISIONS
DIVISION “SS”
SPECIAL REQUIREMENTS

**Standard Supplemental Specifications for the Construction of Public
Infrastructure in the City of Minneapolis**

SS-1 (2565) TRAFFIC CONTROL SIGNALS

This work shall consist of furnishing and installing all materials and electrical equipment to provide a new pretimed, or semi traffic actuated, traffic control signal system at the following locations:

1. System A – Lyndale Avenue S & West 56th Street.
2. System B – Lyndale Avenue S & West 54th Street.
3. System C – Lyndale Avenue S & West 53rd Street.

This work shall consist of removal and salvage of all or portions of in-place traffic signal control systems from the following locations:

1. System A – Lyndale Avenue S & West 56th Street.
2. System B – Lyndale Avenue S & West 54th Street.
3. System C – Lyndale Avenue S & West 53rd Street.

This Contract also includes work which consists of furnishing and installing an interconnect system between traffic control systems:

- A. Interconnection of Systems “A-C” to each other, and removing and reinstalling interconnect to others signal systems as shown on the plans.
- B. The following work to be completed by the “City of Minneapolis” shall consist of furnishing and installing, and removing and salvaging all materials and electrical equipment to provide temporary traffic signal control systems and modifications to the temporary traffic signal control systems “A” and “B”.

The Contractor shall notify the “City of Minneapolis” at least thirty (30) working days before the above work needs to be completed. The Contractor shall also notify the “City of Minneapolis” at least five (5) working days before any modifications to the temporary traffic signals are needed.

This work shall be done in accordance with the applicable Minnesota Department of Transportation “Standard Specifications for Construction,” 2005 Edition.

SS-1.1 GENERAL

All applicable provisions of the current edition of the National Electrical Code shall apply in constructing the traffic control signal systems.

Reference to “the City” or “the City of Minneapolis” in these Special Provisions shall be interpreted to mean “the City of Minneapolis Traffic and Parking Services” or its designated representative.

City forces shall make all field lead connections in the City of Minneapolis furnished traffic signal cabinet at each System. The Contractor for this Contract shall label all cables and conductors in accordance with the field-wiring diagram at each System.

The City shall approve all foundation and loop detector locations before construction is commenced.

The Contractor for this contract shall be responsible for locating all Contractor installed underground facilities within or outside the project limits until acceptance of the completed project by the City.

The City shall review and approve all work performed by the Contractor prior to the Contractor requesting acceptance by the Engineer.

The Contractor’s attention is specifically directed to the requirements of 2565.2A5 regarding the required in service warranty period for workmanship and materials.

SS-1.2 Materials

A. Metal Conduit

Metal conduit shall be Rigid Steel Conduit (R.S.C.) and conduit fittings per Mn/DOT 3801 Intermediate Metal Conduit (I.M.C.) and conduit fittings are not permitted.

B. Non-Metallic Conduit

Non-metallic conduit (N.M.C.) and conduit fittings shall be Type II heavy-wall rigid PVC Schedule 40 plastic conduit and conduit fittings per Mn/DOT 3803.

C. Handholes

New handholes shall be Minneapolis Electrical Handholes with metal frames and covers as shown in the details in the Plans (Minneapolis Detail No. 3776) and shall conform to the City of Minneapolis standards. A drain field shall be provided with each handhole. Concrete for supporting the metal frames and covers in non-sidewalk areas shall be Mix No. 3A32 or equal.

Handhole rings and covers shall be constructed from Class 30 Grey Iron, primed and finish painted.

Relocated handhole rings and covers shall be cleaned and primed and finish painted.

D. Anchor Rods

The Contractor shall furnish all required anchor rods, nuts, and washers in traffic signal pedestal concrete foundations and in mast arm pole foundations.

Minneapolis Mast Arm Foundation: Anchor rods, nuts, and washers in each mast arm pole standard concrete foundation shall conform to the City of Minneapolis standards; shall be galvanized at least the top half of each anchor rod in accordance with the provisions of Mn/DOT 3392; and shall be four (4) sets in quantity (anchor rod, two nuts, and two washers) of the dimensions and configuration in accordance with the “Minneapolis Overhead Signal Foundation” (Minneapolis Detail Nos. 3704 and 3755A) details in the Plans. All anchor rods required in each mast arm pole standard concrete foundation shall be either size 1.75 inches diameter by 71 inches long or 1.5 inches diameter by 68 inches long, as specified. See Minneapolis Detail Nos. A-3035 and A-4152 in Plans.

Traffic Signal Pedestals: Anchor rods, nuts, and washers in each traffic signal pedestal concrete foundation shall conform to the City of Minneapolis standards; shall be galvanized at least the top 28 inches of each anchor rod in accordance with the provisions of Mn/DOT 3392; and shall be three (3) sets in quantity (anchor rod, nut, and washer) of the dimensions and configurations in accordance with the “Minneapolis Signal Base Anchor Rod” detail in the Plans. All anchor rods required in each traffic signal pedestal concrete foundation shall be size 5/8 inches diameter by 40 inches long before bending. See Minneapolis Detail No. 3767.

Rust Inhibitor: Threaded portions of all anchor rods above the concrete foundations shall be coated with an approved rust inhibitor

before installation of the mast arm pole standards, and traffic signal pedestals on the anchor rods.

E. Traffic Signal Electrical Cables And Conductors

The provisions for electric cables and conductors of Mn/DOT 2565.3J and Mn/DOT 3815 are modified as follows. The required electrical cables to Xcel's feed points shall be furnished and installed by the Contractor and shall be the size as required by the power company.

Detector Lead-in Cable: Detector lead-in cable shall meet the requirements of the International Municipal Signal Association (IMSA) Specifications 50-2, latest revision thereof for polyethylene insulated, polyethylene jacketed loop detector lead-in cable. All conductors shall be #14 A.W.G. unless otherwise specified on the Plans.

Signal Control Cable: The multiple conductor control cables for traffic control signals shall meet the following specification. This specification describes multi-conductor Type TC Tray Cable insulated with FR-XLP flame-retardant cross-linked polyethylene and PVC jacketed overall, for use on circuits rated 600 volts at 90 degrees C maximum continuous conductor temperature in wet or dry locations. The cables shall be approved for installation in cable trays in accordance with Article 340 of the NEC and also for use in Class 1 remote control and signaling circuits per Article 725-11(b) of the Code. Cable shall be approved for installation in open air, in ducts or conduits, in tray or trough, and be suitable for direct burial.

SS-1.3 Applicable Standards

The following standards shall form a part of this specification to the extent specified herein:

- Underwriters Laboratories Standard 1277 for Type TC Power and Control Tray Cables.
- Underwriters Laboratories Standard 44 for Rubber Insulated Wires and Cables. ICEA Pub. No. S-66-524, NEMA Pub. No. WC7, Cross-linked-polyethylene-insulated Wire and Cable.
- ICEA Pub. No. S-73-532, NEMA Pub. No. WC57, Control Cables
- IEEE Standard 1202 - Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies.

a. Conductors

Conductors shall be Class B stranded uncoated soft copper conforming to Part 2 of ICEA. Conductor sizes shall be 12 AWG. A non hygroscopic separator may be used over the conductors at the option of the manufacturer.

b. Insulation

Compound: Each conductor shall be insulated with FR-XLP flame-retardant chemically cross-linked polyethylene, meeting the requirements of ICEA S-66-524, Par. 3.6, ICEA S-73-532, Table 3-2 (Type I-XLPE) and Type XHHW-2, VW-1 requirements of Underwriter's Laboratories.

Thickness: The average thickness of insulation shall be 30 mils. The minimum thickness at any point shall be not less than 90 percent of the specified average thickness.

c. Circuit Identification

Circuit identification shall consist of Method 1 color coding for National Electrical Code applications in accordance with ICEA S-73-532, Appendix E, Table E-2. Cables shall contain the following color coding for individual conductors: 1-Black, 2-White, 3-Green, 4-Red, 5-Blue, 6-Orange, 7-Yellow, 8-Red w/Black tracer, 9-Blue w/Black tracer, 10-Orange w/Black tracer, 11-Yellow w/Black tracer, 12-Black w/White tracer. Tracers shall be either spiral bands or hash marks on opposite sides of each conductor.

d. Assembly

The insulated color-coded conductors shall be cabled together with non hygroscopic fillers, when necessary to make round. The cable assembly shall be covered with a suitable tape applied with a 10 percent minimum lap.

e. Overall Jacket

Compound: Each cable shall have a PVC protective jacket applied over the assembly. The jacket shall meet the requirements of Part 4 of ICEA S-73-532, Table 4-2, and the Sunlight Resistant requirements of UL Standard 1277.

Thickness: The average jacket thickness shall be in accordance with UL Standard 1277. The minimum thickness at any point shall be not

less than 80 percent of the specified average thickness.

f. Surface Marking

Cables shall be clearly identified by means of surface ink printing indicating: Manufacturer, Type TC, (UL), 600V, 12 conductors, #12, XHHW-2 (or 90 degrees C) Conductors, Sunlight Resistant, Direct Burial, E57349, and have length markings approximately every meter.

g. Tests

Individual conductors and completed cables shall be tested in accordance with UL requirements for Type TC Power and Control Tray Cables having XHHW-2 VW1 insulated conductors.

Cables shall be capable of passing the ribbon burner cable tray flame test requirements of UL and IEEE Standard 1202.

Signal Head Wire: All circuit wiring from the signal base or transformer base to the traffic signal vehicle and pedestrian indications in pedestal and mast arm poles shall be 1/C#14 AWG solid copper wires with XHHW rating. The conductors shall have insulation color coded in accordance with Minneapolis Detail No's. 3738A, 3738B, 3738C, and 3738D.

Loop Wire: Wire used for inductive loops shall be single conductor No. 14 AWG standard copper insulated with filled chemically cross-linked polyethylene (XLP) and be constructed in accordance with IMSA Specification 511 with a polyvinyl chloride tube.

Roadway loop detector conductors shall be one of the following or approved equal.

- Model DSI-116S Loop Detector Wire as manufactured by Detector Systems, Inc., 11650 Seaboard Circle, Stanton, California 90680;
- Model 1419-XLP-TUBE as manufactured by Kris-Tech Wire Co., Inc. 921 Seneca Street, P.O. Box 4377, Rome, New York 13440-4377;
- Model 320095 Power Loop as manufactured by Tamaqua Cable Products Corporation, P.O. Box 347, Schuylkill Haven, Pennsylvania 17972.

The roadway loop detector conductors shall be approved by the Engineer before procurement.

Single Conductor Wires: The single conductor feeder wires, and control wires shall have Class B stranded annealed uncoated copper conductors and be listed by UL as Type RHW-2/USE-2, 90 degree C, cross linked polyethylene insulation rated 600 volts in accordance with Article 338 of the National Electrical Code. Cable shall meet the requirements of ICEA Publication No. S-66-524, NEMA Pub. No. WC7 for Cross-linked Polyethylene-Insulated Wire and Cable, and UL Standard 854 for Service Entrance Cables. Wires shall bear UL label for Type USE2, have footage markings approximately every meter, and surface marking indicating manufacturer's ID, conductor size and metal, voltage rating, UL symbol and type designations. **The insulation on each conductor shall be colored red, black, green, or white in accordance with the color-coding shown in the construction plan and/or details.**

EVP Confirmation Light Cable: Wire used for powering EVP confirmation lights shall be 2/c #14 W/GRD conforming to the requirements of International Municipal Signal Association, Inc., Specification No. 50-2 1984, Polyethylene Insulated, Polyethylene Jacketed Loop Detector Lead-In Cable.

Optical Detector Cable: Optical detector cable shall be in accordance with the provisions of Mn/DOT 3815.2C5.

SS-1.4 Mast Arm Pole Standards

The provisions of Mn/DOT 3831 are modified as follows for Minneapolis Style Equipment:

Each mast arm pole standard shall consist of a transformer base, a vertical pole shaft, a traffic signal upper cantilever mast arm, provisions for a lower mast arm for sign support, and (if specified in the Plans) a luminaire vertical pole shaft extension with davit-type mast arm and a lower sign arm.

Each mast arm pole standard shall be designed and constructed in accordance with the requirements of the 1994 edition of the "Standard Specifications for Structural Support for Highway Signs, Luminaires and Traffic Signals" as published by the American Association of State Highway and Transportation Officials."

The transformer base shall be stainless steel, constructed in accordance with details shown in the Plans, and be a square transformer base style

complete with access hole and door. The access hole shall provide an opening of at least 100 square inches on one side of the base and shall be provided with a door having positive closure. The locking mechanism shall be an integral part of the door.

The extended end of each traffic signal mast arm shall have a 2-3/8 inch outside diameter slip-fitter and signal mounting plate welded to the end in accordance with the details in Mn/DOT Standard Plate No. 8123E for attaching one-way or two-way mast arm signal head mounts.

Attachment of the traffic signal upper and/or lower cantilever mast arm to the vertical pole shaft shall be by high strength bolts and nuts.

Each mast arm pole standard shall be the City of Minneapolis design, as shown in the detail section of the Plans.

Each individual mast arm pole standard shall be constructed to the traffic signal mast arm length, luminaire mast arm length, and luminaire mounting height as specified in the Plans.

The Contractor shall furnish to the Engineer, for approval, seven (7) complete sets of shop detail drawings of each type of mast arm pole standard in accordance with the provisions of Mn/DOT 2471.3B. The shop detail drawings shall indicate all member materials and dimensions, section modulus of all main component parts, and other pertinent data and calculations. The shop detail drawings shall be identified by "City of Minneapolis" and the fabricator. The City of Minneapolis Traffic and Parking Services shall approve shop drawings.

A shop coat of primer and finish paint shall be applied to the outside surfaces of each mast arm pole standard, mast arm, luminaire extension and transformer base.

SS-1.5 Traffic Signal Pedestals

The provisions of Mn/DOT 3832 are modified as follows:

Each traffic signal pedestal shall consist of a pedestal base with access door opening; pedestal shaft; three tie rods; and a pedestal slip-fitter collar with signal bracketing and pipe fittings in accordance with City of Minneapolis standards. Each pedestal slip fitter collar shall have four (4)

1.5 inches diameter threaded side openings spaced 90 degrees apart with unused openings plugged with gasketed, threaded caps.

The overall length of each installed traffic signal pedestal shall be 10 feet.

For assembly information for the City of Minneapolis traffic signal pedestal, see Minneapolis Detail No. 3701 in the Plans.

SS-1.6 Pedestrian Push Button Stations, Pedestrian Push Buttons, and Pedestrian Instruction Signs

Each pedestrian push button station shall consist of a concrete foundation with bumper post collar, a 4-inch diameter standard black steel pipe with standard threaded pipe cap on top, and a flasher - push button base, all conforming to the City of Minneapolis standards. See Minneapolis Detail Nos. 3706, 3712, 3713 and 3775 in the Traffic Signal Detail Sheets in the Plans. A non-metallic cap approved by the Engineer may be used on top of the pedestrian push button station.

All pedestrian push buttons required by the Plans shall be in accordance with the provisions of Mn/DOT 3833 and the following:

1. The Contractor shall furnish to the Engineer, for approval, three (3) sets of shop drawings and specifications. The proposed push button assemblies shall be ADA-compliant and subject to approval by the City of Minneapolis Traffic and Parking Services. The three copies shall be distributed by the Engineer as follows:
 - City of Minneapolis Traffic Division (3 copies)
2. A pedestrian instruction sign shall be furnished to the Contractor by the City for installation with each pedestrian push button installation in accordance with the provisions of Mn/DOT 3833.

SS-1.7 Accessible Pedestrian Push Buttons and Signs

Pedestrian push button installation shall be in conformance with the Mn/DOT Standard Specifications for Construction 3833 modified as follows:

Pedestrian push buttons shall be installed on mast arm pole shafts, pedestal shafts, light pole shafts or be a separate mounting in conformance with Mn/DOT APS Push Button Mounting Detail or ADA Pedestrian Station Detail. These Details can be found on the Office of Traffic, Safety, and Operations (OTSO) WEB site for Traffic Signals:

<http://www.dot.state.mn.us/products/index.html>

Each push button shall be located by the engineer in the field to allow easy access for the pedestrian.

The Contractor shall supply the APS system in full, including push buttons, control boards, central control units, configurators, and any other

equipment needed to provide the APS system. Approved APS systems are listed on the Mn/DOT Approved/Qualified Products Lists WEB site for Signals: <http://www.dot.state.mn.us/products/index.html>

The Contractor shall insure the order form below is presented to the Accessible Pedestrian Signal (APS) manufacturer so the appropriated Braille message will be added to the pedestrian information sign and the correct voice messages will be programmed in the pedestrian push button stations.

**Accessible Pedestrian Signal (APS)
 ORDER FORM**

(Fill out one form per intersection)

Intersection:

Total Qty of Pedestrian Push Buttons _____

Control Board: One needed for each intersection **Qty** 1

CCU: (Central Control Unit) One needed for each intersection **Qty** 1

CONFIG: (Configurator) One needed for each intersection **Qty** 1

Push Button and Sign Braille Information

Button	Arrow Direction R/L		Street Name (Street Being Crossed)
PB2-1		PB2-1	
PB2-2		PB2-2	
PB4-1		PB4-1	
PB4-2		PB4-2	
PB6-1		PB6-1	
PB6-2		PB6-2	
PB8-1		PB8-1	
PB8-2		PB8-2	

Custom Voice Message Details

Voice on Location and Walk Message(s) Please give phonetic pronunciation on difficult street names so that the message will be recorded correctly.

*Note that unless Street, Drive, Avenue etc...are absolutely necessary for intersection identification, it is recommended to not include them in the verbal message.

PB2-1

Wait Message:			
Wait to Cross	<input type="text"/>	at	<input type="text"/>
	(Street Being Crossed)		(Intersecting Street)
Walk Message:			
	<input type="text"/>	Walk sign is on to cross	<input type="text"/>
	(Street Being Crossed)		(Street Being Crossed)

PB2-2

Wait Message:			
Wait to Cross	<input type="text"/>	at	<input type="text"/>
	(Street Being Crossed)		(Intersecting Street)
Walk Message:			
	<input type="text"/>	Walk sign is on to cross	<input type="text"/>
	(Street Being Crossed)		(Street Being Crossed)

PB4-1

Wait Message:			
Wait to Cross	<input type="text"/>	at	<input type="text"/>
	(Street Being Crossed)		(Intersecting Street)
Walk Message:			
	<input type="text"/>	Walk sign is on to cross	<input type="text"/>
	(Street Being Crossed)		(Street Being Crossed)

PB4-2

Wait Message:			
Wait to Cross	<input type="text"/>	at	<input type="text"/>
	(Street Being Crossed)		(Intersecting Street)
Walk Message:			
	<input type="text"/>	Walk sign is on to cross	<input type="text"/>
	(Street Being Crossed)		(Street Being Crossed)

PB6-1

Wait Message:			
Wait to Cross	<input type="text"/>	at	<input type="text"/>
	(Street Being Crossed)		(Intersecting Street)
Walk Message:			
	<input type="text"/>	Walk sign is on to cross	<input type="text"/>
	(Street Being Crossed)		(Street Being Crossed)

PB6-2

Wait Message:			
Wait to Cross	<input type="text"/>	at	<input type="text"/>
	(Street Being Crossed)		(Intersecting Street)
Walk Message:			
	<input type="text"/>	Walk sign is on to cross	<input type="text"/>
	(Street Being Crossed)		(Street Being Crossed)

PB8-1

Wait Message:			
Wait to Cross	<input type="text"/>	at	<input type="text"/>
	(Street Being Crossed)		(Intersecting Street)
Walk Message:			
	<input type="text"/>	Walk sign is on to cross	<input type="text"/>
	(Street Being Crossed)		(Street Being Crossed)

PB8-2

Wait Message:			
Wait to Cross	<input type="text"/>	at	<input type="text"/>
	(Street Being Crossed)		(Intersecting Street)
Walk Message:			
	<input type="text"/>	Walk sign is on to cross	<input type="text"/>
	(Street Being Crossed)		(Street Being Crossed)

SS-1.8 Service Equipment For Signal System

The electrical service point for each signal system is shown on the Plans. The service points shown are approximate; the exact locations will be determined in the field by the Power Company and the City. See signal plan Equipment Schedule for specific service cabinet requirements at each service point.

A. Service Lateral

Service laterals shall be as shown on City of Minneapolis Standard Plate No. 3770C. Conduit type & size shall be as shown on the plans.

In addition to the above the following requirements for electrical service connections to each signal system as detailed below shall apply:

- Power shall be obtained from a power company wood pole, ground mounted transformer, or other source as noted in the Plans (Contractor shall field verify power source).
- Service equipment, conduit, and power conductor wiring shall be replaced for all locations where signal systems previously existed and are being revised.
- When service feeds for Signal Systems are to be provided from an existing signal/street light service cabinet, the Contractor shall provide a connection to the service cabinet and all necessary cable, conduit and meter socket.
- Service feeds for operating temporary signal systems shall not be disrupted until the newly constructed systems are ready to be made operational.

SS-1.9 Terminal Blocks

The provisions for terminal blocks of Mn/DOT 2565.3J5 are modified as follows. The referenced terminal block terminals and screws shall be **nickel-plated brass** and be Kulka 603 series or equivalent.

SS-1.10 Vehicle Signal Faces – Polycarbonate

A. Signal Indications:

All "Red", "Yellow", and "Green" signal indications shall utilize light-emitting diode (LED) units. Mn/DOT approved LED units are

listed on the Mn/DOT Qualified Products List on the Office of Traffic, Safety, and Operations (OTSO) WEB site for Traffic Signals:

<http://www.dot.state.mn.us/products/signals/led-indications.html>

The provisions of Mn/DOT 3834 (ITE Vehicle Signal Faces) are modified as follows:

The housings, housing doors, tunnel-type visors, lenses, and background shields of new vehicle signal indications and faces mounted on the traffic signal upper cantilever mast arms shall be fabricated from polycarbonate resin material in accordance with the latest issue of the ITE standard for Adjustable Face Vehicular Traffic Control Signal Heads. The housings shall be one piece with the front, sides, top, and bottom integrally molded. Each vehicle signal face shall be sectional with separate adjustable housing for each vehicle signal indication. The housings, housing doors, visors, and background shields on overhead mast arms and on vertical pole shaft and pedestal-mounted signals shall be black in color. The color shall be completely impregnated in the resin material and scratches shall not expose uncolored material.

- (a) The LED unit shall be sealed with a one-piece neoprene or EPDM (Ethylene, Propylene, Diene Monomers) gasket and shall be watertight.
- (b) A.C. or D.C. voltages at the input terminals of the LED indication shall be below 15 volts within 200mS after removing power. The indication shall work with a conflict monitor utilizing NEMA plus functions, specifically DUAL INDICATION.

All vehicle signal faces with LED indications shall be approved by the City prior to procurement.

Support plates shall be furnished with each overhead mast arm mounted vehicle signal face to distribute stresses evenly over the ends of the vehicle signal face. Also, a plumbizer adapter in conformance with Mn/DOT Standard Plate No. M8124E shall be furnished with each overhead mast arm mounted vehicle signal face. Support plates and plumbizer adapters shall be black in color.

For each LED signal indication, the Contractor shall submit to the Engineer, for approval, four copies of all warranty information indicating the required 6-year warranty period (**from date of installation**), product invoice, and documentation indicating name of manufacturer, model number, and serial number. The four copies shall be distributed by the

Engineer as follows:

- City of Minneapolis Traffic Division (2 copies)

For all LED signal indications, the manufacturer shall provide the following warranty provisions:

- Replacement or repair of an LED signal module that exhibits a failure due to workmanship or material defects within the first 72 months of field operations.
- Replacement or repair of "RED", YELLOW and "GREEN" LED signal modules that fall below the requirements for ITE

The Contractor shall, to the satisfaction of the Engineer, affix to the back of each "LED" signal indication a permanent label, or permanently marked (utilizing a "oil based paint marker") with the actual date of installation. The oil based paint marker shall be a contrasting color to ensure that the date can be easily read.

B. Optically Programmed Vehicle Signal Faces (Special Signal Faces)

The optically programmed vehicle signal faces shall conform to the requirements of Mn/DOT 3834.2B with the following modification to the second sentence of the first paragraph of 3834.2B3:

“The exterior of the signal housing, lamp housing and mounting flanges shall be finished with a high quality baked enamel, prime and finish painted a good quality black for overhead mast arm installations and for vertical pole and pedestal installations as directed by the Engineer.”

C. Pedestrian Signal Faces with Countdown Timers - Polycarbonate

Each pedestrian signal indication of each pedestrian signal face shall be a single section. The size shall be nominal 16 inch x 18 inch as called for in the Plans and the indication shall utilize the international hand and walking person illuminated message and countdown timer. Each pedestrian signal face housing, housing door, and visor shall be black in color. The color shall be completely impregnated in the resin material and scratches shall not expose uncolored material. The pedestrian signal face with countdown timers shall be listed on the Mn/DOT Qualified Products List on the Office of Traffic, Safety, and Operations (OTSO) WEB site for Traffic Signals:

<http://www.dot.state.mn.us/products/signals/signalfaces.html>

The pedestrian indications with countdown timer shall utilize light-emitting diode (LED) units from the Mn/DOT Qualified Products List on the Office of Traffic, Safety, and Operations (OTSO) WEB site for Traffic Signals:

<http://www.dot.state.mn.us/products/signals/signalfaces.html>

D. Housing

Unused mounting holes shall be plugged to provide a watertight seal. A plug shall be provided for the bottom-mounting hole which the pedestrian signal shall have mountings to properly fit brackets made of 1.5-inch pipe. The openings shall have a common vertical centerline through the housing to permit 360-degree rotation of the mounted pedestrian signal. The bottom and top opening shall be provided with a serrated ring, which shall permit indexing and locking of the signal in 5-degree increments throughout the entire 360 degrees of rotation when used with serrated brackets or fittings. The mounting brackets shall serve as the electrical conduit for the pedestrian signal.

A terminal block shall be mounted to the internal bosses at the bottom of the single section head assembly. The terminal block shall be a six position, twelve terminal barrier type strip and shall be secured on both ends. Jumpers shall be installed on the lower row of terminal screws between adjacent pairs of terminals. The following terminal designations shall be used in terminating LED leads: Walk (LED), Walk (field), DW (LED), DW (field), N (LED), N (field) on the upper row of terminal screws.

E. Visor

Each signal head shall have a removable tunnel type visor for each signal indication. The visor shall be fabricated from black polycarbonate resin material and shall encompass the entire top and sides (bottom open) of the pedestrian signal face. The visor shall be designed to fit tightly against the door so as to prevent any perceptible filtration of light between the door and the visor. The top of the visor shall have a downward tilt of approximately 3-1/2 degrees. The length of the visors shall be a minimum of 9 inches with all sides of the visor approximately the same length. Visors shall be secured by at least six stainless steel screws

F. Optical Unit

a) Module shall be constructed for installation within the signal

housing assembly without any modification to either the housing assembly or the LED module.

- b) Each unit shall be labeled with the manufacturers trademark, identification number, voltage rating and up arrow indication.
- c) Insulation displacement connectors shall not be used.
- d) Under no circumstances shall a “Walk” indication supersede a “Don’t Walk” indication when any amount of voltage is applied to both inputs.
- e) The LED unit shall include a one piece neoprene or EPDM (Ethylene, Propylene, Diene Monomers) gasket which shall make an assembled housing and LED module watertight.
- f) A.C. or D.C. voltages at input terminals of the L.E.D. shall be below 15 volts within 200ms after removing power. The indication shall work with a conflict monitor utilizing N.E.M.A. plus functions, specifically DUAL INDICATION.
- g) Each module shall have one opening located in each of the four corners to secure the module to the housing assembly door.
- h) Each LED module shall:

Be wired to the terminal strip located in the housing. The “Walk” input wire to the module shall be connected to the 1st terminal on the terminal strip, the “Don’t Walk” input wire to the module shall be connected to the 3rd terminal on the terminal strip and the neutral wire for the module shall be connected to the 5th terminal on the terminal strip.

- i) The manufacturer shall provide the following warranty provisions:
 - Housing Assemblies furnished shall be guaranteed to be free from electrical, mechanical, or structural defects for a period of 18 months from the date of delivery, and any such defects developing within warranty period shall be remedied free of all expense to the City.
 - LED modules shall have a minimum 6-year (72-month) warranty period from the date of installation. The warranty shall cover the replacement cost including the price of the unit and shipping. This warranty shall cover

the replacement or repair of any LED signal module that exhibits a failure due to workmanship or material defects or falls below the minimum intensity levels.

- The Contractor shall, to the satisfaction of the Engineer, affix to the back of each pedestrian signal indication a permanent label or permanently marked (utilizing an “oil based paint marker”) with the actual date of installation. The oil based paint marker shall be a contrasting color to ensure that the date can be easily read.

SS-1.11 Painting

All surfaces of the pedestrian signal housing and housing door shall be black in color. All surfaces of the visor shall have a dull non-reflective black finish.

The color shall be completely impregnated in the polycarbonate resin material of the molded parts such that scratches will not expose uncolored material. Color to be approved by the City prior to manufacture.

SS-1.12 Manufacturer's Drawings, Specifications, and Sample Unit

The Contractor shall submit to the Engineer for approval by the City one (1) module and four sets of manufacturer's drawings and specifications of the pedestrian signal face. The supplier shall also provide at the time of submission of unit for approval written certification in the form of independent test results that the pedestrian indication equipment to be supplied meets or exceeds ITE performance requirements for intensity and color.

The Contractor shall also submit to the Engineer, for approval by the City, four copies of all warranty information, a Manufacturers' Certificate of Conformance to this specification, and all other pertinent manufacturer data. As part of the pertinent manufacturer data, the Contractor shall include the product invoice.

The Engineer shall distribute two copies of the above documents as follows:

- City of Minneapolis Traffic and Parking Services

SS-1.13 Inspection

The pedestrian signal shall be approved by the Engineer prior to procurement by the Contractor.

SS-1.14 Luminaires on Signal Poles

The luminaires located on the luminaire extension on mast arm signal poles shall be furnished and installed under the signal portion of the Contract. All work related to luminaires installation on street light poles shall be furnished and installed under the street lighting portion of the contract. The luminaire fixture and slip fitter are described in the Lighting portion of the Special Provisions.

All circuit wiring to streetlight poles that are utilized as traffic signal standards shall be furnished and installed under the lighting portion of the Contract. Wiring from the transformer base to the luminaire (2-1/c#12 AWG stranded wires with THHN/THWN rating) shall be furnished and installed under the signal portion of the Contract. One conductor shall have insulation colored black, and the other shall have white colored insulation.

SS-1.15 Concrete Foundations/Bases

Concrete for all foundations shall be Mix No. 3Y43 free of chloride additives, placed and consolidated using vibratory equipment and be finished all in accordance with the provisions of Mn/DOT 2565.3F except that edges **shall not** be chamfered or beveled, but shall be neat and straight. Concrete shall be allowed to cure for a minimum of seven (7) days before being placed into use unless otherwise permitted by the Engineer.

SS-1.16 Intersection Controller and Cabinet

The City will furnish and install all traffic signal controllers and cabinets complete with all internal control equipment, including Contractor furnished EVP & Video Detection equipment (if required in the plans), for use on this project at each system.

SS-1.17 Availability of Materials

Push button collars and bases and Minneapolis Standard fluted pedestal signal poles and bases that meet the requirements of these Special Provisions are available and may be purchased at the option of the Contractor from the Minneapolis Traffic and Parking Services, depending upon the timeliness of the order, and availability of the material in City stock. Contact the Traffic Stores office at 612-673-5750 or Dave Prehall at 612-673-5759, cell 612-221-5322.

SS-1.18 CONSTRUCTION REQUIREMENTS

1. Staging

The Contractor shall review the roadway construction phasing plan and shall plan his work accordingly.

2. Conduit Placement

Where N.M.C. conduits are required to be placed underground below roadway surface areas that are to be reconstructed with bituminous or concrete pavement, the N.M.C. conduit shall be placed and backfilled (if trenching method used) and compacted to the satisfaction of the Engineer before any new pavement is placed.

Exposing existing utilities and surface restoration shall be considered incidental to the work required to provide a complete conduit system installation.

The Contractor shall install red City of Minneapolis Traffic and Parking Services marking tape for marking underground transportation utilities at a distance of 6 inches above all new conduit placed by the trenching method. The required marking tape shall be purchased by the Contractor at the City of Minneapolis Traffic and Parking Services Office, 300 Border Avenue North. Provision and installation of the marking tape by the Contractor shall be considered incidental work to furnishing and installing the conduit.

Existing conduit to be reused as part of a revised permanent signal system (as shown in the Plans) shall be reused in accordance with the provisions of Mn/DOT 2565.3D5.

Extension of Conduits: The Contractor shall provide a continuous length of conduit of size and type noted on the Plans between the specified terminal points.

Installation of Conduit into Handhole: Conduits shall be installed into handholes by use of a hole saw to cut through the handhole wall. Areas surrounding conduit entrances shall be sealed by filling them with mortar. Conduits shall be installed entering handholes through the sidewalls of the handholes, not through the bottom gravel foundation. Conduits shall extend a minimum of 2 inches and no more than 3 inches into the handhole.

Connection to Existing Conduits: The Contractor shall locate the ends of existing conduit as shown on the Plans and extend the conduit to handhole, signal base, etc., which is to be built by the Contractor. Existing conduit shall be cut perpendicular to conduit and

exterior surface cleaned to form secure connection to extension.

Installation of Conduits: The conduits shall be installed a maximum of 12 inches from the back of the curb, as shown in the Plans or as directed by the Engineer. Except as required to bypass foundations, the base on which the curb is placed shall not be disturbed. All conduits installed across newly surfaced streets shall be installed at a minimum depth of 24 inches or as directed by the Engineer.

Where existing sidewalks, pavement, or streets are opened, the opening shall be refilled to the original thickness using material equal to that removed, and the surface restored. In sidewalk areas whole panels shall be removed and replaced unless a utility joint exists in which case only the portion of the walk above the installation up to the joint need be removed and replaced.

In general, all conduits shall be straight and true, and all offsets and bends shall be uniform and symmetrical. Field bends of conduit shall only be accomplished with the use of an approved conduit heating/bending mechanism designed for that purpose. The Contractor shall adjust the elevations of the conduit assembly for its full length to approximately the same gradient as the finished roadway, and shall furnish and install, in the trench such suitable spacers and framing as may be necessary to maintain the correct grade and alignment. The cover material shall be firmly tamped into place in 6-inch lifts to minimize uneven settlement above or below the conduit

Installation of Conduits Under Driving Surface and Sidewalk: All conduits that are to be placed under driveways, streets and sidewalk that are not scheduled for removal shall be directional bored, or installed by another method approved by Engineer that will not damage or disturb the integrity of the driveway, street or sidewalk. All conduits that are to be placed under driveways, alleys, streets, or sidewalk that are scheduled for removal must be placed during the time between the removal of the existing surface and the commencement of pavement operations. The Contractor is responsible for coordination with the paving Contractor.

Installation of Conduits Under Driving Surface and Sidewalk Outside Paving Limits: All conduits that are placed under driveways, streets and sidewalk that are not scheduled for removal as part of the street or sidewalk paving shall be placed either by directional boring, surface removal or other approved methods. Any required surface removal and restoration shall be considered incidental to the work

required to provide a complete conduit system installation. Damage to pavement or sidewalk shall be remedied at the Contractor's expense.

Conduit Attached to Wood Poles (Service): All conduits terminating near the top of a wood pole shall utilize a metal weatherhead service entrance type fitting with knockouts (knockouts shall not be opened if not used). Conduit shall be attached to a wood pole by galvanized RSC straps spaced 3 feet apart, or as directed by the Engineer.

Duct Seal: Duct seal or other Engineer approved material shall be furnished and installed to seal all controller cabinet and service cabinet conduit entrances as necessary in accordance with Mn/DOT 2565.3D2b.

Conduit Ends in Handholes: All ends of non-metallic conduit entering a handhole shall be trimmed by the Contractor, on the inside and outside of cut ends to remove rough edges. Conduits shall extend a minimum of 2 inches and no more than 3 inches into the handhole.

SS-1.19 Concrete Traffic Signal Cabinet Foundations

The concrete traffic signal cabinet foundations for the City furnished and installed traffic signal cabinets shall be installed in accordance with the details as shown on the detail sheets in the Plans. All foundation locations shall be approved by the City before construction. Concrete pad finishing shall be smooth, level, and flat. No more than 0.125 inches of variability compensated by shims will be allowed. Variability in excess of this will require resurfacing or replacement at the direction of the Engineer. Inspections will be performed using a Contractor supplied City approved ½" thick steel template manufactured to match cabinet dimensions. The first pad shall be inspected in detail, approved and used as the standard for finish and workmanship. All templates required are incidental to the project.

SS-1.20 Video Camera and Detection

The Contractor shall furnish, install and make operational all VIVDS ("Video Imaging Vehicle Detection System") components for the new permanent signal systems as shown in the Plans and as follows. The Contractor shall furnish and install all cables and conductors, mounting hardware, and each video detection device as per the Plans and to the satisfaction of the Engineer.

All equipment necessary as well as the equipment in each controller

cabinet to operate each video detection system shall be new devices furnished and installed by the Contractor.

At least 14 days prior to when the applicable traffic signal cabinet is required on the project, all necessary materials and electrical equipment required in the traffic signal cabinet, and all documentation, maintenance and operation manuals, and wiring diagrams shall be delivered to Larry Mountjoy at the City of Minneapolis Signal Shop at 300 Border Avenue North, Minneapolis, MN 55405.

Each video detection system shall be complete and in operation and shall be incidental to the applicable new permanent Traffic Control Signal System.

1. General

This specification sets forth the minimum requirements for a system that uses only video images.

a. System Hardware

The video detection system shall consist of one or two wide-angle video cameras, a shelf mounted video detection processor (VDP), an Ethernet communication module, a shelf mount video monitor, and a pointing device

b. System Software

The system shall include software that detects using only the video image. Detection zones shall be defined using only an on board video menu and a pointing device to place the zones on a video image. Up to 24 (TS1) or 64 (TS2) detection zones shall be available. A separate computer shall not be required to program the detection zones.

2. Functional Capabilities

The VDP shall have the capability to process different video sources. The source can be a video camera or stored images. The video shall be input to the VDP in MJPEG format and shall be digitized and analyzed in real time.

Detection zones shall be programmed via an on board menu displayed on a video monitor and a pointing device connected to the VDP. A typical detection zone shall be approximately the width and length of three cars.

The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters. A separate computer shall not be required for programming detection zones or to view system operation.

The VDP shall store at least three different detection zone patterns. The VDP shall be able to switch to any one of the different detection patterns within 1 second of user request via menu selection with the pointing device.

The VDP shall detect vehicles in real time as they travel across each detection zone.

The VDP shall have an Ethernet port for communications with an external computer.

The VDP shall accept new detector patterns from an external computer through the Ethernet port. A Windows™-based software designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

The VDP shall be able to send its detection patterns to an external computer through the Ethernet port.

The camera system shall be able to transmit a MJPEG video signal, with minimal signal degradation, up to 1000 feet under ideal conditions.

The associated Video Detection Processor (VDP) shall default to a safe condition, such as a constant call on each active detection channel, in the event of loss of video signal.

The system shall be capable of automatically detecting a low-visibility condition such as fog and respond by placing all defined detection zones in a constant call mode. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s). The system shall automatically revert to normal detection mode when the low-visibility condition no longer exists.

3. Vehicle Detection

A minimum of 24 detection zones shall be supported and each detection zone shall be able to be sized to suit the site and the desired

vehicle detection region.

A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default to indicate vehicle presence on a single phase of traffic movement.

Placement of detection zones shall be done by using only a pointing device, and a graphical interface built into the VDP and displayed on a video monitor, to draw the detection zones on the video image from the video camera.

Sampling detectors shall not be used during the operation of the detection zones.

A minimum of 3 detection zone patterns shall be saved within the VDP memory. The VDP's memory shall be non-volatile to prevent data loss during power outages.

The selection of the detection zone pattern for current use shall be done through a menu. It shall be possible to activate a detection zone pattern for a camera from VDP memory and have that detection zone pattern displayed within 1 second of activation.

When a vehicle is detected crossing a detection zone, an on screen indication shall be provided such as the flashing of the detection zone on the video overlay display screen to confirm the detection of the vehicle.

Detection shall be at least 98% accurate in good weather conditions and at least 96% accurate under adverse weather conditions (rain, snow, or fog).

Detector placement will typically not be more distant from the camera than a distance of ten times the mounting height of the camera.

The VDP shall provide up to 24 (TS1) outputs of vehicle presence detection or 64 (TS2) outputs of vehicle detection. The 24 outputs may also be wired directly to the terminal facility on the back panel.

The VDP shall provide dynamic zone reconfiguration (DZR) to enable normal detector operation of existing channels. The VDP shall operate normally while modifying a zone plan and place a constant call only during the learning cycle.

The VDP shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VDP shall output a

constant call during the background learning period.

The VDP shall output a constant call in the case of a catastrophic system failure.

Each of the detection zone outputs shall be configurable to allow the selection of presence and delay outputs. Timing parameters of pulse and delay outputs shall be user definable between 0.1 to 300.0 seconds.

All detection zones shall be capable of counting the number of vehicles detected per camera input. The count value shall be internally stored in at least 15 minute and 60 minute bins for later retrieval through the Ethernet port.

4. VDP Hardware

The VDP shall be designed to mount on a standard shelf. No adapters shall be required to mount the VDP.

The VDP shall operate satisfactorily in a temperature range from -37°C to +74°C and a humidity range from 0%RH to 95%RH, non-condensing.

The VDP shall be powered by 110 or 220 volts AC and not exceed 1.5 amps of power consumption.

The VDP shall include an Ethernet port for communications with a remote computer. The VDP Ethernet port shall accept a 568B patch cable and connect to the front of the VDP.

The VDP shall utilize flash memory technology to enable the loading of modified or enhanced software and firmware through the USB port without modifying the VDP hardware.

The VDP shall include detector output pin out compatibility with industry standard TS1 or TS2 cabinets.

The front of the VDP shall include detection indications, such as LED's, for each channel of detection that displays detector outputs in real time when the system is operational.

The front of the VDP shall include one VGA video output providing real time video output that can be routed to other devices.

Video inputs shall be made via CAT5e burial grade cable terminating

with a lock ring connector to ensure secure connections. RCA or other straight friction plug-in type connections shall not be allowed.

The VDP unit shall interface with up to two cameras using RJ-45 interface connectors.

The interface unit shall support the use of USB pointing devices. The unit shall support either a USB mouse or trackball. Pointing devices shall not require vendor specific pointing device software drivers.

The VDP shall allow real-time video to be transported via VGA to independent streaming video players simultaneously in CIF or other optimal resolution.

The VDP shall provide digital pan-tilt-zoom functionality within the fixed video image to view the entire intersection.

5. Access/Communication Module

The interface device shall provide capabilities to enable multiple video detection processors (VDP's) to be locally and remotely accessed from a single point via one set of user interface devices. User interface devices are defined as a pointing device and video monitor, laptop or remote desktop.

The device shall allow the operator to view video output display for all video detection processors via the video monitor or by using the remote access software.

All local programming and setup parameters for vehicle detection shall be user accessible through the interface devices without requiring the user to swap interface cables.

Remote access to the device shall be through the built-in Ethernet port via access software running on a Windows™-based personal computer.

Remote access over a WAN or LAN shall also be available for remote setup and diagnostics of the interface unit.

The interface unit shall support streaming video technology using MPEG4, Motion JPEG or H.264 standards to allow the user to monitor video detection imagery over the Ethernet interface.

By default, the user shall be able to view all detection zones

simultaneously on the output video monitor.

Access to the VDP via the interface unit shall be under password control and the client interface shall allow the user to change the password.

A unique IP address shall be assignable to view the live video from a secure, remote location.

The interface device shall be specifically designed to mount on a standard TS-1 and TS-2 shelf. No adapters shall be required to mount the interface device in a standard shelf.

An Ethernet port shall be integrated within the interface unit. The Ethernet port shall conform to 802.3 Ethernet specifications and shall auto-sense between 10 and 100 Mbps data rates. Industry standard TCP/IP (UDP and TCP packets) protocol shall be supported. The Ethernet connection shall be made through a RJ-45 connector.

6. Video Detection Camera

The video cameras used for traffic detection shall be furnished by the VDP supplier and shall be qualified by the supplier to ensure proper system operation.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 1.0 lux to 10,000 lux.

The camera shall use a CMOS sensing element and shall output color video with resolution of not less than 1920 lines horizontal.

The camera shall include an electronic shutter control based upon average scene luminance.

The camera shall include a fixed focal length lens with fixed focus that shall not need adjustment to suit the site geometry. The horizontal field of view shall be a fixed 180 degrees. A single camera shall be capable of providing detection coverage of all approaches of an intersection.

The camera electronics shall include AGC to produce a satisfactory image at night.

The camera shall be housed in a weather-tight sealed enclosure. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.

The camera enclosure shall be equipped with an integrated sun shield.

The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens shutter at low temperatures and prevent moisture condensation and ice buildup on the optical faceplate of the enclosure.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -35 °C to +74 °C and a humidity range from 0% RH to 100% RH.

The camera shall be powered via Power Over Ethernet (POE) from the VDP. Power consumption shall be 55 watts or less under all conditions.

Camera placement shall be on the horizontal portion of the street lighting davits above or adjacent to the roadway as shown in the plans.

The camera shall provide reliable detection within the height to distance ratio of 10:100. Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.

The camera enclosure shall be equipped with weather-tight cable connections. Video and power shall be transmitted via the CAT 5e burial grade cable and connected within the same connector to the VDP.

7. Cat 5e Cable:

The Cat-5E cable shall be industrial grade, have sunlight and flame resistant jacketing and be suitable for outdoor and underground applications. This specification describes an unshielded twisted pair data communications cable with 4-pair 24 AWG solid-bare copper conductors with (HD-PE) high density polyethylene insulation, a flooded poly-gel core and a (FR-PE) flame retardant black polyethylene jacket overall. The cable shall possess the following

electrical and physical characteristics:

- Rating: 60 degree C 300V
- Conductor Resistance: Max 92.8 ohms/km @ 20 degrees C
- Potential Withdraw: DC 500V/1 min or AC 350V/1 min
- Insulation Resistance: 1500MO/km DC 500V (between wire and ground)
- Spark Test: 2.5KV

The cable shall be approved for installation in open air, in ducts or conduits, and be suitable for direct burial and possess the following features:

- High-Performance Data Communications Cable
- Suitable for 350MHZ High-Speed Data Applications
- Suitable for Gigabit Ethernet, Fast Ethernet and 155MBPS TP-PMD/CDDI
- Suitable for Outdoor Installations
- Category-5E Unshielded Twisted Pair (UTP) Cable
- 4-Pair – Easily Identified Color-Striped Pairs
- AWG24 Solid Copper Conductors
- FRPE Jacket (CMX) for Outdoor Use with Flooded Core
- Excellent Attenuation and Crosstalk Characteristics

8. Applicable Standards

The following standards shall form a part of this specification to the extent specified herein:

- Underwriters Laboratories Subject 444
- EIA/TIA 568 specifications
- ISO/IEC 11801 specifications

9. Installation

The CAT 5e burial grade cable to be used between the camera and the VDP in the traffic cabinet shall be designed for direct burial installations.

This cable shall be suitable for installation in conduit or overhead with appropriate span wire. All connections shall be made in accordance with the manufacturer's instructions.

The cabling shall comply with the National Electric Code, as well as local electrical codes.

The Contractor shall install the cameras on luminaire mast arms at the location directed by the Engineer; in accordance with the manufacturer's guidelines; and to the satisfaction of the Engineer. If, in the opinion of the Engineer, it is necessary to install extension brackets in order for the luminaire mast arm mounted cameras to obtain satisfactory operation the Contractor shall provide and install them as part of the intersection detection. The cameras shall be mounted and secured in an aimed position by the Contractor. The Contractor shall mount and level the camera per manufacturer's instruction. Drip loops shall be provided for the camera cable.

The video detection system shall be installed by supplier factory certified installers and as recommended by the supplier and documented in installation materials provided by the supplier. Proof of factory certification shall be provided.

CAT-5E Cable Installation

The contractor shall test all Cat-5E cables installed in the controller cabinet with a tester specifically designed for testing continuity through an RJ-45 connection. The contractor shall provide a test report – typed or handwritten – for the Cat-5E cables in each cabinet. The test shall state the date of the test, individuals who performed test, identify each cable tested, and state whether the cable passed. All non-passing cables shall be corrected by the contractor.

1. Limited Warranty

The supplier shall provide a limited three-year warranty on the video detection system.

During the warranty period, technical support shall be available without charge from the supplier via telephone within 4 hours of the

time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

Updates to the Video Detector Processor software shall be available from the supplier without charge for the life of the product.

2. Maintenance and Support

The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the video detection system. These parts shall be available for delivery within 30 days of order placement.

The supplier shall maintain an ongoing program of technical support for the video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order.

Installation and training support shall be provided by a factory authorized representative without charge.

All product documentation shall be written in the English language.

3. Deliverables

One video detection system including all necessary cabling for connection within the cabinet shall be provided for each location to be installed as shown in the plans. One manufacturer approved industrial hardened color video monitor and pointing device shall be provided per intersection. A Windows™-based software package designed for local or remote connection and providing video capture, real-time detection indication and detection zone modification capability shall also be provided with the system.

Upon proper orientation and connection of the various video detection cameras by the contractor, the factory authorized representative shall assist and train City of Minneapolis personnel in utilizing all software, setting up detection zones and channel assignments as well as establishing the other necessary parameters for a properly performing detection system.

One new spare Video Detection Processor (VDP) module and one new spare video camera shall be provided to the City of Minneapolis for maintenance purposes upon acceptance of the video detection systems.

The video detection systems shall be a GridSmart Spectra 360

Vehicle Detection System as manufactured by Aldis, Inc., 10545 Hardin Valley Rd., Knoxville, TN, 37932; phone number (865)482-2112 or City of Minneapolis approved equal.

4. Handholes

Frames and covers shall be set in a bed of mortar and leveled to the finished surrounding grade. Cast-iron frame covers constructed in accordance with City of Minneapolis Details No. 3711 and 3776 shall be furnished and installed by the Contractor.

Conduits shall be installed by the use of a hole saw to cut through the handhole wall. The area surrounding the conduit entrance shall be sealed with a mortar filling. Conduits shall extend a minimum of 2 inches and not more than 3 inches into the handhole.

Painting of the cast-iron frames and covers shall be as specified elsewhere in these Special Provisions.

The Contractor shall remove to the bottom of the handhole, any excess material inside of existing handholes that are to be reused.

The Contractor shall salvage in place handholes not reused as part of a revised permanent signal system unless otherwise directed by the Engineer.

Frames and covers shall be painted and then pretreated prior to concrete placement such that the concrete does not adhere to exposed surfaces. Frames and covers shall be cleaned free of adhering concrete after placement.

5. Installation of Mast Arm Poles

The Contractor shall mount all transformer bases directly on the foundation. The use of the lower anchor rod nuts for leveling is not permitted. The lower anchor rod nut shall be tightened snug against the upper plate of the transformer base after leveling. Any pole that is not plumb shall be correctable up to ½-inch using stainless steel washers. The Contractor, at the Contractor's expense, shall recap foundations that are incorrectly installed.

6. Signal Out Requirements

During the period when each existing or temporary signal system is de-energized, traffic signs will be required to inform motorists that the signal indications are not operating. The Contractor shall furnish,

erect, and maintain “Stop Ahead” and “Stop” signs and barricades. The quantity and size of the temporary signs and barricades as well as their placement in the field shall be as directed by the Engineer. The Contractor shall furnish and install materials to keep these signs upright and stationary. The signs, barricades, etc., shall remain the property of the Contractor. The Contractor shall notify the Engineer five (5) days in advance of de-energizing the system. The Engineer shall approve the day and time and duration of these events.

7. Vehicle And Pedestrian Signal Face Installation

Pedestal Mounted: The provisions of Mn/DOT 2565.3L1 are modified to include the following:

Vehicle and pedestrian signal faces required to be mounted at the top of traffic signal pedestals shall be mounted in accordance with the “Minneapolis Standard Signal Assembly” detail 3782A shown in the Plans.

Vertical Pole Shaft Mounted: The provisions of Mn/DOT 2565.3L2 are modified to assure that vehicle and pedestrian signal faces required to be mounted on a vertical pole shaft of a mast arm pole standard shall be mounted in accordance with the Minneapolis Standard Signal Assembly Detail No. 3783 shown in the Plans.

The pedestrian indications Type 30A(R) and Type 30A(L) shall have no lower bracket and banding as shown.

The one-way pole mounted vehicle indications Type 10A shall have the upper mounting bracket attached to the vertical pole shaft by the use of knurled steel threaded inserts and not by banding.

The two-way pole mounted vehicle indications Type 20A shall have the upper mounting bracket attached to the vertical pole shaft by the use of knurled steel threaded inserts and not by banding.

Pedestrian Signal Attachment: Pedestrian signals shall be attached to the signal assembly plumbing using 1 ½” X 2” galvanized steel nipples to connect the signal to the 90-degree elbow at the top of the pedestrian signal. The pedestrian signal assembly shall be held in place on the 1 ½” plumbing through the use of a 2” – gauge plated steel bushing and a 1 ½” by ½” galvanized steel lock nut.

8. Placing Traffic Control Signals In Operation

All vehicle signal faces and pedestrian indications shall be bagged or turned away from traffic immediately after erection to clearly indicate that the signal is not in operation. All bagging shall be gunnysacks or other like material approved by the Engineer and shall be maintained by the Contractor to the satisfaction of the Engineer. Bagging shall be of a grey or light brown color so as to clearly indicate that the signal face is not in use. Orange, red, or black bagging will not be permitted.

When the signal system is to be placed in operation, all vehicle signal faces and pedestrian indications shall be unbagged and aimed as directed by the Engineer.

At the time of controller cabinet connection by the City and at turn on, the Contractor shall have on hand and available at the location: spare lamps of each size, workers and equipment to reach overhead indications, and shall perform such work as may be required to correct such incidents as may be revealed in the connection and/or energization process. Only the City shall place the signal system in operation.

9. Pedestrian Push Button and Pedestrian Instruction Sign Installation

Pedestrian push buttons shall be installed on vertical mast arm poles and on traffic signal pedestal shafts in conformance with Mn/DOT Standard Plate No. 8115D. Where pedestrian push buttons are to be installed as a separate mounting, the installation shall conform to the City of Minneapolis Detail No. 3706 and be approved by the Engineer before installation.

A pedestrian instruction sign shall be purchased by the Contractor from the City and installed by the Contractor with each pedestrian push button installation. The sign shall be provided with suitable brackets furnished by the Contractor for shaft mounting directly above the push button or shall be mounted as directed by the Engineer.

10. Control Cable Installation

At each system, before cabinet installation by the City, the Contractor for this Contract shall terminate all new electrical cables and conductors extending above the cabinet concrete foundation as follows:

Cables:

- Shall be cut 6.5 to 10 feet above the cabinet concrete foundations, and
- Shall have the ends taped, and
- Shall be labeled with the cable number as per the field wiring diagram - (label shall be applied 12 inches above the cabinet concrete foundation), and
- Shall be coiled, tie wrapped, and left in a neat manner.

11. Completed Intersection Installation Testing

After successful installation of all items required in the Plans and Special Provisions, the City shall inspect and test each intersection prior to acceptance of the completed installation.

Each completed intersection installation shall function to the satisfaction of the Engineer and in accordance with the intent of the Plans and Special Provisions.

12. Traffic Signal Cabinet

The cabinets will be furnished and installed by the City.

Controller Timing: Timing settings for controller units will be furnished and installed by the City.

EVP & Video Detection Equipment: The Contractor shall provide cabinet located EVP electronics and all cabinet located Video Detection hardware and any necessary additional harnessing to the Engineer for delivery to the City of Minneapolis. City forces will test, and then install and connect the equipment in the traffic signal cabinet.

13. Installation And Connection Of Permanent Cabinet And Control Equipment

At each system, the City of Minneapolis will furnish, install and connect the traffic signal cabinet, complete with controller unit and all required signal control equipment, including Contractor supplied components. Contractor forces shall be on site to assist the City during the installation process to trouble shoot issues identified during the cabinet installation/connection process.

14. Operation Of Traffic Signals

Temporary Traffic Signal Systems: The Contractor shall not interfere with the operation of the traffic control signal system at any time at any intersection, except as may be otherwise authorized by the Engineer.

The City will utilize temporary signals to provide temporary operation at each intersection where temporary signal operation is required.

The Contractor shall remove and salvage all items of the existing traffic control signal systems not used in the temporary signal operation.

Continuous Operation: The Contractor shall ensure that a traffic control signal system is in operation at all times at those intersections where he is or has worked, except as may be otherwise directed by the Engineer.

Traffic Control Interconnect: The City requires that an operational traffic signal interconnect system be maintained through the project area until such time as the in place traffic signal systems are turned off. If the traffic signal interconnect system is utilized to communicate with other intersections outside of the project area a temporary interconnect system may have been installed and will need to remain in place and intact until such time as its functionality is can be replaced by a newly installed system. The Contractor shall not make any changes to or remove any part of the permanent or temporary interconnect system without first contacting and receiving the approval of the Minneapolis Traffic Division.

If temporary interconnect facilities are shown in the Plans, the City will furnish and install all materials, equipment and labor required to maintain an operating temporary interconnect system for all signals within the project limits as well as any systems whose interconnect functions are carried on cables passing within or through the project limits.

15. Painting

The Contractor shall furnish all paint required after verification of the exact paints and colors with the City of Minneapolis Traffic and Parking Services.

At each system, all painting shall be in accordance with the provisions of Mn/DOT 2565.3T, except that finish coat paint for all

traffic signal system items shall be two (2) manufacturers shop coats as modified below.

Pedestrian push button assemblies and handhole frames and covers shall be finish painted with Exterior Enamel, Signal Green, conforming to the City of Minneapolis Specifications.

Handhole rings and covers shall be primed with a red oxide primer and finished with a City-approved Green Exterior Enamel. If field painting is required, it shall be approved in advance and be accepted by approval of the Engineer.

Traffic signal pedestal bases, traffic signal pedestal shafts, traffic signal pedestal slip-fitter collars, all signal brackets and pipe fittings, all pedestrian push button stations and all pedestrian push button station bases shall be finish painted with Exterior Enamel Thermoset Acrylic, Minneapolis UPS Brown, conforming to Minneapolis Specifications.

A shop coat of primer paint shall be applied to the outside surface of all poles, bases, and shafts. Mast arm pole vertical shafts, traffic signal mast arms, auxiliary sign arms, luminaire pole shaft extensions, luminaire mast arms, and mast arm pole transformer bases shall be finish painted with Exterior Enamel Thermoset Acrylic conforming to the following color requirement and specifications of the City of Minneapolis:

- Paint color shall be Minneapolis UPS Brown.

The fitter on the top of the luminaire extension that transitions from the extension to the luminaire fixture shall be UPS Brown.

Dull Non-Reflective Black enamel shall be used on visors, directional louvers and background shields.

SS-1.21 REMOVING, SALVAGING, AND STOCKPILING EXISTING MATERIALS AND ELECTRICAL EQUIPMENT

This work shall consist of the removal of all or portions of existing traffic signal control systems.

A. Removing And Salvaging Existing Systems

When directed by the Engineer, the Contractor shall remove and salvage for the City all items of the existing traffic control signal systems, signal equipment, interconnect cable, foundations, handholes, service equipment, and signs in accordance with the

applicable provisions of Mn/DOT 2104; with the applicable provisions of Mn/DOT 2565.3U; and the following:

1. Underground conduit and handholes shall be removed, unless otherwise directed by the Engineer.
2. Salvaged items shall be disassembled as directed by the Engineer and shall be delivered to the City of Minneapolis Traffic and Parking Services Division at 300 Border Avenue North, Minneapolis.

The Contractor shall contact the City Traffic and Parking Services office 24 hours in advance of delivery as follows:

Traffic Stores: 612-673-5750 or

Dave Prehall: 612-673-5759, cell 612-221-5322

3. Salvaged items shall be disassembled before being delivered to the City of Minneapolis as follows:
 - Vehicle signals and pedestrian signals shall be removed and left intact.
 - Remove background shields from vehicle signal faces without damaging shields or signal faces.
 - Remove and disassemble all signal bracketing and pipe fittings without damaging signal bracketing and signal faces.
 - All signal and communication cables and conductors salvaged shall be neatly coiled and tagged with correct footage.
 - Mast arm pole standards shall be disassembled by unbolting and removing mast arms, overhead signal head mounts, and signal brackets. All nuts and bolts shall be packaged and tagged.
 - Luminaires shall be removed from the luminaire mast arms.
 - Pedestal shafts and shaft rods shall be removed from pedestal bases. Pedestal slip fitter collars shall be removed and all set screws and plugs left intact.
 - Service equipment, conduit risers, power conductors, etc., shall be removed from service wood poles and conduits disconnected from enclosures.
 - Signs and sign brackets shall be removed from signal poles and mast arms.
 - All other salvable items shall be removed and disassembled as directed by the Engineer.

- Existing handhole frames and covers that are not to be reused shall be salvaged and delivered to the City.
 - Where controller equipment is being replaced, the existing traffic signal cabinet electronics will be removed and salvaged by the City.
 - Traffic signal cabinets shall be disconnected from all field cabling before removal. Damage to terminal facilities resulting from the removal/transportation process shall be billed to the Contractor.
4. Concrete cabinet and pole foundations, conduit, and items deemed non-salvageable by the Engineer of each existing traffic control signal system shall be removed and disposed of outside the right-of-way in any manner that the Contractor may elect subject to the provisions of Mn/DOT 2104.3C3 and as noted elsewhere in these Special Provisions.
 5. The concrete cabinet and pole foundations, and the underground signal conduits may include asbestos containing electrical conduits (Transite). The 3' x 18" vertical pipe in handholes may also contain asbestos, Transite pipe. Underground signal conduits that contain asbestos will have been encased in concrete at the time of installation. For the procedure for handling and disposal of these asbestos-containing materials See the "Technical Specifications for the Excavation of Asbestos-Containing Electrical Conduit" located in the appendix of these Special Provisions.
 6. Removing underground signal conduits containing asbestos shall be paid for as part of the street lighting items in this contract (see lighting specifications). The removal of traffic signal handholes and foundations containing asbestos shall be paid for as part of the lump sum cost for Salvage Signal System. Refer to the street lighting specifications Appendix for information regarding this removal.
 7. All removal, disposal, and salvaging of materials of the existing traffic control signal systems, as required by the Plans and Special Provisions shall be paid for in accordance with the "Method of Measurement and Payment" included in a separate section.

SS-1.22 TYPE C AND D SIGNS

This work shall consist of furnishing and installing Type C and Type D sign panels, and installing City furnished signs as directed by the

Engineer, in accordance with the applicable provisions of Mn/DOT 2564; with the details shown in the Plans; and as follows:

A. General

The Contractor shall furnish and install Type C and Type D sign panels on traffic signal mast arms, pedestal shafts, or mast arm pole shafts as indicated in the Plans.

Each Type C sign shall be in accordance with the Standard Sign Drawings of the Mn/DOT Standard Signs Manual and with the applicable provisions of Mn/DOT 3352.

B. Materials

Sign base, sign face and sign legend material for sign panels Type C and Type D shall be in accordance with the applicable provisions of Mn/DOT 2564, except the sign face and legend material shall be as follows:

Sign face material for sign panels shall be Direct Applied Wide Angle Prismatic Retroreflective Sheeting for Visual Impact Performance (VIP) manufactured by 3M Company.

Sign legend material for sign panels shall be Direct Applied Wide Angle Prismatic Retroreflective Sheeting for Visual Impact Performance (VIP) manufactured by 3M Company, except where black legend is specified the sign legend material shall be in accordance with Mn/DOT 3352.2A5c or Mn/DOT 3352.2A5d.

C. Fabrication

Type D sign panel layouts are dimensioned as follows:

1. Vertical Dimensioning

The dimension given is for the legend component having the largest vertical dimension in the particular line of copy. Other legend components are centered on the larger legend component unless indicated otherwise.

2. Horizontal Dimensioning

The horizontal dimensions given within the sign panel are to the tenth of an inch and are cumulative representing the distance

from the left edge of panel to the extreme left edge of the legend component.

3. Sign Panel Recap

The position of an arrow is measured in degrees counterclockwise from a right horizontal reference line. The abbreviation MOD used in the sign panel recap = Modified.

D. Mounting Sign Panels

Each pedestal pole shaft or mast arm pole shaft mounted Type C sign shall be furnished with two standard sign mounting bracket assemblies (utilizing a minimum 21 mm wide stainless steel band), or at the option of the City and at the direction of the Engineer the Contractor shall drill and tap shaft, and each sign shall be mounted on each mast arm pole or pedestal pole at the location shown in the Plans.

Each Type C and mast arm mounted Type D sign panel shall be provided with mounting brackets as required and mounted at the location on the mast arm as specified in the Plans to the satisfaction of the Engineer and in accordance with the Mn/DOT Standard Signs Manual.

For sign panels less than 30 inches in height, the Contractor shall furnish the appropriate number of U-bolt brackets detailed on Page No. 105A of the Mn/DOT Standard Signs Manual (number of U-bolt brackets based on the sign panel length tabulated in the SIGN POST SPACING CHART in the Plan -**NOTE that maximum spacing between U-bolt brackets shall not exceed 45 inches**) and install U-bolt brackets at the appropriate spacing as specified in the SIGN POST SPACING CHART.

For sign panels greater than 24 inches in height, the Contractor shall furnish the appropriate number of pipe posts detailed on Page 105B of the Mn/DOT Standard Signs Manual (number of pipe posts based on the sign panel length tabulated in the SIGN POST SPACING CHART in the Plan -

NOTE that maximum spacing between U-bolt brackets shall not exceed 45 inches) and install pipe posts at the appropriate spacing as specified in the SIGN POST SPACING CHART.

When attaching the U-bolts to the mast arm, the Contractor shall NOT install all U-bolts such that all “Z” brackets face the same

direction as detailed in Section A-A on Page No. 105B of the Mn/DOT Standard Signs Manual. This will prevent a sign panel from “walking off” the mast arm if sign bracketing loosens in the future.

The Contractor shall furnish and install a fabrication sticker (see example) in accordance with the provisions of Mn/DOT 2564.3H.

SIGN COMPANY NAME AND ADDRESS HERE

Month: 1 2 3 5 4 6 7 8 9 10 11 12 Year: 11 12 13 14 15 16

E. Measurement and Payment

Furnishing and installing Type C and Type D sign panels and installing City furnished signs, at the locations indicated in the Plans, and as specified herein shall be considered incidental work to each traffic control signal system and no direct compensation shall be made therefore.

SS-1.23

TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM

This work shall consist of the installation at all the intersections, as shown in the Plans, a Priority Vehicle Detection and Control System (PVDCS). The PVDCS shall detect and identify priority vehicles such as emergency and non-emergency vehicles for preemptive or priority traffic signal service.

Commonly used abbreviations:

(PVDCS) Priority Vehicle Detection and Control System

(NEVP) Non-Emergency Vehicle Preemption, low priority

(EVP) Emergency Vehicle Preemption, high priority

The PVDCS shall consist of a matched system of equipment that includes optical emitters, optical detectors, optical detector cables, phase selectors and confirmation light assemblies. The system shall work with the local intersection traffic signal controller to provide an effective total system operation.

The PVDCS shall employ infrared optical communication to detect the presence of all priority vehicles and collect and record pertinent priority vehicle information.

Once operational, the PVDCS shall require no additional action from the vehicle operator to provide proper operation. The system shall provide

priority operation on a first-come, first-served basis with high priority requests overriding low priority requests.

For application in Minneapolis, the PVDACS shall interface to traffic signal controllers. It shall be the Contractors responsibility to work with the City to verify proper operation of the total system.

F. System Description

The system shall utilize infrared optical communications technology to process valid optical signals emitted from authorized vehicles, and place calls to traffic controller preempt inputs to effect preemption of normal traffic control signals.

Components of the system shall consist of infrared optical emitters mounted on authorized vehicles, infrared receivers mounted in the intersections and interfaced to traffic controllers via an optical signal processor and confirmation lights mounted at the intersections.

Optical emitters shall emit infrared optical signals on both the industry standard high-priority carrier frequency 14.035 Hz (Emergency band), or the industry standard low-priority carrier frequency 9.639 Hz (Transit band) by user programmable selection.

Receivers shall consist of infrared optical detectors, mounted to view the approaches to intersections, an optical signal processor (OSP) installed in the traffic control cabinet and wired to the preempt call inputs of the traffic controller, and detector cable connecting the optical detectors to the OSP.

As emitter equipped vehicles approach receiver equipped intersections, the optical detectors shall convert the incoming optical signal into an electronic signal. The OSP shall decode the electronic signal, delivered by the detector cable, determine the priority of the vehicle, arbitrate priority between any simultaneously approaching vehicles, place appropriate calls to controller inputs, and log vehicle detection events.

1. The OSP shall be capable of categorizing vehicles in both emergency and transit signal bands. The OSP shall be capable of the following actions, configurable on a per-band basis:
 - a. Local preempt – if enabled, the OSP shall place a call on the appropriate controller input in response to vehicle detection. (Default shall be enabled)

- b. Logging – if enabled, the OSP shall be capable of writing a log record in non-volatile memory consisting of the following information: (Default shall be enabled)
 - Signal band
 - Direction
 - Call duration
 - Final greens at end of call
 - Duration of final greens
 - Event start time and end time in real time
- c. Real-time announcement of vehicle detection – if enabled, the OSP shall send a short message via, RS-232 port upon the start of vehicle detection processing. The message shall consist of the following information: (Default shall be disabled)
 - Signal band
 - Direction
- d. Real End of event echo – if enabled, the OSP shall echo the complete log record for a vehicle detection event immediately after the end of the event. The information included shall be those items enumerated in 1.b above. (Default shall be disabled)

System receivers shall always give precedence to emergency band vehicles over transit band vehicles.

System receivers shall be capable of detecting emitter-equipped vehicles at a range of up to 2,500 feet (762 meters), under clear atmospheric conditions.

System receivers shall be interface with all NEMA TS-1 and TS-2 and Type 2070 traffic controllers equipped with programmable preemption routines, with no compromise to normal traffic controller functions.

Optical signal processors must be field programmable by the user, using the manufacturer's system software via computer.

G. System Components

1. Optical Emitter

Optical emitters shall generate the optical signal required to activate the receiver equipment in the intersection. The light

pulses shall consist of a fixed base frequency emergency or transit band signal for standard preemption systems.

Optical emitters shall effect the range adjustment of the system by using activated optical emitters positioned at the desired distance while the optical signal processor range adjustment features are activated in the traffic cabinet.

2. Optical Detector

Infrared optical detectors shall be manufactured from black UV stabilized polycarbonate suitable for all weather use. The detector electronics shall be waterproof.

Infrared optical detectors shall sense and transform optical energy from optical emitters into electrical signals to be decoded by the optical signal processor.

Infrared optical detectors shall sense optical emitter signals over an adjustable range of 2500 feet (762m) in optimum atmospheric conditions.

Infrared optical detectors shall transmit electrical signals to the optical signal processor via up to 1000 feet of optical detector cable.

Infrared optical detectors shall have an internal terminal strip with wiring label for convenient positive connection to the detector cable.

Infrared optical detectors shall have at least a nominal conical 13-degree field of view centered about the view port normal axis.

Infrared optical detectors shall operate over a range of 12 to 30 VDC and current of up to 50ma maximum.

Infrared optical detectors shall have a 1/2 inch or 3/4 inch FNPT mounting connection.

Infrared optical detectors shall be capable of performing a regularly occurring detector initiated diagnostic routine that tests all components used in the receipt and processing of incoming light pulses.

3. EVP Confirmation Lights

The confirmation light assembly shall be constructed from standard electrical hardware in conformance to the arrangement and configuration requirements described herein and shown on the Plans.

When the controller begins processing an EVP request, the controller shall also generate preempt confirmation outputs indicating that an EVP request is being processed (confirmation outputs shall only be generated for EVP & rail operation).

The EVP confirmation outputs shall be wire connected to unused load switches in the controller cabinet. The circuits shall be connected to EVP confirmation lights in the intersection.

The controller circuits shall be programmed to provide an illuminated solid white light to the requesting phase of EVP service and illuminated flashing white lights to all other vehicle phases.

4. Optical Detector Cable

Optical detector cable shall be in accordance with the provisions of Mn/DOT 3815.2C5.

5. Optical Signal Processor

Optical signal processors shall be installed in the traffic controller cabinet to receive the electrical signals from optical detectors. The optical signal processor shall interface directly with Type 2070 controllers with compatible software, and NEMA TS-1 and TS-2 with suitable system interface equipment and software.

Optical signal processors shall be powered from 120 VAC (95VAC to 135VAC), 60 Hz power and have an on board, regulated power supply that supports up to 10 optical detectors.

A communication module, which shall arbitrate priority between the signal processor modules, logs events, and provides RS-232 communication with the outside world for system configuration during installation, and real time communication with the traffic controller or central system during operation.

Non-volatile memory shall be included for storage of configuration parameters and event logs. Retention time for the

non-volatile memory module shall be a minimum of 10 days with system power off.

The optical signal processor front panel shall have at least the following features:

- Power on/off switch with corresponding LED indicator.
- LED indicators for emergency and transit band reception status for each of four channels.
- Test switches for activating internal diagnostics.
- Optical signal processors shall have a method for enabling the setting of detection range without software interface with the RS232 port. All available channels and bands shall be able to be armed simultaneously for range setting.
- Optical signal processors shall have an RS-232 communications port.
- Indicator lights that identify optical detectors which have failed a self test routine.

Programming the optical signal processor and retrieving data stored in it via the RS-232 port shall be accomplished using an IBM PC-compatible computer either locally or remotely via a modem.

The optical signal processor shall be capable of receiving and logging both standard emergency and transit band signals from system vehicles.

Optical signal processors shall log and store a minimum of 1,000 events in non-volatile memory. When the log is full, the oldest entry shall drop off to allow the newest entry to be logged.

6. System Software

Optical signal processor software shall be provided on CD-ROM. It shall run on IBM compatible computers with Windows 95, 98, NT 4.0, 2000, and XP software.

The software shall provide windows and menus for programming emergency and transit vehicle parameters, intersection and channel names, timing parameters, desired green signal indications during priority control operation, and for viewing and downloading logged information.

H. Environmental

All equipment supplied as part of the optical preemption traffic control system intended for use in the controller cabinet shall meet the electrical and environmental specifications spelled out in the NEMA Standards Publications TS2-1992 Part 2 where applicable.

I. Qualifications

The manufacturer or their qualified agents shall supply a list of at least five preemption system users having experience with the various types of preemption system components available from the manufacturer for a minimum of three years.

Manufacturers shall be able to demonstrate the ability to provide on going technical and product warranty support.

Manufacturer or the manufacturer's representative shall provide responsive service before, during and after the installation of the priority control system. The manufacturer or the manufacturer's representatives shall provide training to the system installer and maintenance department of the purchasing agency. Training shall consist of proper installation and operating procedures for the system hardware and software.

J. Warranty

The manufacturer shall warrant that system components that fail due to material flaws or workmanship shall be replaced or repaired under manufacturers published warranty provisions for a period of not less than 10 full years from the date of installation.

K. Contractor Work Tasks

The Contractor shall:

Furnish all PVDCS materials and equipment, mounting hardware, wiring, cables, optical detectors, confirmation light assemblies and bulbs, phase selectors, mounting brackets, detector connection cables, cable termination strips, communication cables, test equipment and computer software and other items as required. Install optical detectors with confirmation light assemblies at the locations shown on the Plans.

Aim, orient, test operate and demonstrate that the optical detectors at each intersection provide effective EVP system operation as required for the conditions shown on the Plans.

- Install detector and confirmation light wiring from the detector

device to a controller cabinet terminal strip.

- Provide installation assistance services and support to the City during controller cabinet hookup and connection of the Contractor furnished in-cabinet materials by the City to provide the operations and service described herein.
- Demonstrate correct operation of each properly equipped and operational intersection to serve as acceptance tests of the PVDCS system and components.
- Provide system and component documentation.
- Provide system and component application and maintenance training to support the proper installation and operation of system components.
- Provide PC-based software and interconnection cables to fully implement all components into a complete operational system.

L. City Work Tasks

City forces shall:

- Furnish necessary qualified staff to attend application and training seminars.
- Furnish and install all controllers, controller equipment and cabinets.
- Install and connect all Contractor furnished PVDCS in-cabinet equipment.
- Connect Contractor installed optical detector wires to in-cabinet equipment.
- Connect Contractor installed confirmation light wires to in-cabinet equipment.
- Connect Contractor provided cable between the signal greens and the phase selector inputs.
- In general, install and connect all Contractor furnished in-cabinet equipment and cables.

M. Optical Detector Mounting and Confirmation Light Assembly

Combination optical detector mounting and confirmation light assemblies shall be furnished and installed at each intersection as shown on the Plans.

Each assembly shall be made up from UL listed standard electrical hardware to provide a sturdy and weatherproof assembly suitable for mounting optical detectors and confirmation lights.

Each assembly shall be designed to mount two optical detectors and two confirmation lights. When less than two optical detectors or

confirmation lights are used, the unused mountings shall be capped or plugged in an approved manner.

Each confirmation light assembly shall consist of incandescent lights that will operate in conjunction with the PVDCS to indicate the occurrence of a high priority preemption call.

Confirmation lights shall be wired to provide confirmation for each preemption phase.

An illuminated solid white light shall be displayed to the directions of traffic flow represented by the preempt phase, illuminated flashing white lights will be displayed to all other approaches.

Confirmation displays shall only be used with emergency vehicle or rail preemption.

Reflectorized outdoor type flood lamps shall be provided for each confirmation lamp holder by the Contractor.

N. Priority Control Interface Software

The Contractor shall provide PVDCS PC based software to enable direct uploading and downloading of settings and control commands and the downloading of data describing priority vehicle operation.

The PVDCS interface software shall be provided on CD-ROM. It shall run on IBM compatible computers with Windows 95, 98, NT 4.0, 2000, and XP software, a touchpad and keyboard.

It shall be possible to connect a personal computer directly to the phase selector serial port to upload and download information and data. Local connection shall permit all upload and download operations to be provided in the field.

The Contractor-supplied priority control interface software shall enable:

- Setting up and presenting user-settable system parameters
- Viewing and changing settings
- Viewing activity screens
- Displaying and downloading records of previous activity showing all items of recorded information

The Contractor-supplied priority control interface software shall accommodate operation via the keyboard and touchpad.

The Contractor-supplied priority control interface software shall provide menu displays to enable:

- Establishing signal intensity thresholds (detection ranges), timing parameters, modem initialization, and intersection name.
- Resetting and/or retrieving logged data and priority vehicle activity.
- Setting of desired green signal indications during priority control operation, and upload and download capability to view.
- Addressing for each card in a multi-drop connected system.
- Confirmation light configuration when optical signal processor driven.
- NEMA control parameters.

O. Optical Detector Installation Requirements

The Contractor shall install optical detector and confirmation light assemblies and shall wire each intersection as shown on the Plans and as required herein.

The Contractor shall assemble and install the optical detectors in accordance with detector manufacturer's recommendations and these special provisions.

The Contractor shall construct each optical detector mounting and confirmation light assembly from standard UL listed electrical construction hardware. Each assembly shall consist of a steel nipple with top and bottom locknuts, a four-way steel Crouse-Hinds conduit with a gasketed, screw retained cover, a short optical detector connection nipple with top and bottom locknuts, optical detector(s) and one or two screw mount incandescent flood lamp holders with flood lamps. The conduit and each flood lamp assembly shall be designed, constructed and finished for outdoor use. The flood lamp holder shall be Carlon Model P80010HCD Nonmetallic Weatherproof Lighting System Lampholder or approved equal. Gaskets shall be provided and installed on the conduit cover and around the flood lamp base to provide a weatherproof assembly. The assembled parts shall be arranged with both conduit and terminal compartment covers facing in vehicle approach direction. Hardware shall be provided to allow signal mast arm, or pedestal mounting as indicated in the Plans.

The nipple length, optical detector position and flood light final alignment shall provide at least 6 inches of separation between the optical detector and the lamp. Reflectorized, outdoor type 40-watt flood lamps shall be provided.

After assembly, aiming, tightening and final mounting on the mast arm or pedestal pole, all extension hardware and exposed threads shall be painted the same color as signal framework or mast arms to which they are attached. Contractor shall secure paint to insure added components match the color of supporting facilities.

All assemblies whether for one optical detector and one confirmation light or for more than one optical detector or confirmation light shall utilize a 1-inch nominal conduit and nipples.

Threaded caps or plugs shall be used to cover any unused mounting holes. Optical detector unit drain holes shall be oriented as recommended by the manufacturer.

The Contractor shall mount the optical detector mounting and confirmation light assembly on the top edge of the mast arms. Mounting hubs shall be located at 2 ft., 4 ft., and 6 ft. from the end of the mast arm as shown on the Plans or as directed by the Engineer. In any event, the final mounting position shall be adjusted to provide lateral clearance between.

Traffic signal heads and traffic signs shall be adjusted to provide a clear line of sight for priority vehicles.

The Contractor shall either have hubs for mounting attached during pole manufacturing. If hub locations are not useable the Contractor shall mount the optical detector and confirmation light assembly using a Frey Manufacturing Model KBR- 3/4-inch pipe thread hub. The Contractor shall follow the manufacturers recommended installation instructions to properly align the drilled hole. Each mast arm mounting shall be installed such that the finish detector mounting will be plumbed perpendicular to the earth.

The Contractor shall install enough cable to ensure sufficient unspliced length to connect the optical detector and confirmation light assembly fixtures at the top of signal poles or mast arms to the controller cabinet. Strain relief shall be provided in all poles for detector and indicator cables.

All field wiring shall be furnished, installed and connected to the field units. All wiring shall run to the controller cabinet and shall be coiled at the controller cabinet as directed by the Engineer. Each lead shall be taped to exclude moisture and be tagged to indicate phase and function.

P. PVDCS System Acceptance and Testing

The Contractor shall provide information describing the proposed equipment including unit specifications and certifications that the furnished equipment conforms to the manufacturer's specifications and these special provisions. The Contractor shall also conduct tests to verify the operation of the furnished materials and equipment and to verify the proper installation of system components.

After all field connections have been completed and wiring is connected at the controller cabinet, the City shall conduct component operations and aiming verification tests.

The tests shall verify that:

- The appropriate vehicles were detected and identified and that the appropriate outputs are generated.
- The zone of detection was appropriate for each type of vehicle.
- The Contractor shall have appropriately equipped personnel on-site to correct any problems associated with the Contractors work.

Q. PVDCS Training and Documentation

If the PVDCS hardware and/or software is of a different manufacture than that which is currently utilized by the City, the Contractor shall provide a training session covering installation, maintenance and repair of all PVDCS components provided under this contract. The Contractor shall provide manuals for the training activities and to support the operation of the system.

The Contractor shall provide hookup and connection details as required to enable the proper operation of the PVDCS equipment in the field.

Documentation shall also be provided describing each of the PVDCS software programs furnished to meet the requirements of this project.

It is understood that the programs provided for this project are the property of the Manufacturer or others. The programs provided shall, however, be for unlimited licensed use by the City of Minneapolis. It is also required that the City be permitted to make any number of copies of the program for use by City forces. The City shall not distribute or otherwise make available copies of the program or programs to any other party unless specifically authorized by the Manufacturer or owner of the software.

R. PVDCS Measurement and Payment

Furnishing and installing materials and electrical equipment as specified herein, all to provide an installed and successfully tested Priority Vehicle Detection and Control System at each intersection shall be considered incidental work to each new permanent traffic control signal system and no direct compensation shall be made therefore.

SS-1.24 METHOD OF MEASUREMENT AND PAYMENT

A. Purpose

This section shall define the bid items and the manner in which payment will be made to the Contractor.

B. Miscellaneous Work, Equipment, and Material

Items of miscellaneous work, equipment and material will be required to construct each system including such items as flagmen and traffic control personnel, traffic cones, markers, flashers, barricades, bolts, nuts, washers, electrical wire, etc. In each case where these items or similar miscellaneous items are necessary to the completion of the project in a safe and reliable fashion, their provision, use and installation by the Contractor shall be considered included in the various associated items of work and no direct payment will be made therefor.

C. Measurement

Furnishing and installing all materials and electrical equipment (except for an intersection traffic signal cabinet complete with controller unit and all required signal control equipment which will be furnished and installed by the City of Minneapolis); all to provide complete fully operational Traffic Control Signal Systems "A", "B", "C" in Minneapolis as contained in these Special Provisions and in the Plans will be measured as an integral unit complete in place and operating.

Removing and salvaging an existing traffic control signal system at: Systems "A", "B", "C" as contained in these Special Provisions and in the Plans will each be measured as an integral unit.

D. Basis of Payment

1. Payment for traffic control signal system installation shall be in accordance with Mn/DOT 2565.4 and Mn/DOT 2565.5 respectively for a Fully Operational Signal System. Payment shall be compensation in full for all costs of furnishing and installing signal equipment, poles, pedestals, luminaires, foundations, conduit, handholes, cable, signal service and equipment, and all incidentals in accordance with the following schedule at the appropriate contract bid price for the specified unit of measure.

ITEM NO.	DESCRIPTION	UNITS
2565.522	Traffic Control Signal System "A"	Signal System
2565.522	Traffic Control Signal System "B"	Signal System
2565.522	Traffic Control Signal System "C"	Signal System

2. Payment for removing and salvaging existing traffic control signal systems shall be in accordance with Mn/DOT 2565.4 and Mn/DOT 2565.5 respectively Salvage Signal System. Payment shall be compensation in full for all costs of salvaging, removing and disposing of signal equipment, poles, pedestals, luminaires, foundations, conduit, handholes, cable, service cabinets, hazardous materials, and all incidentals in accordance with the following schedule at the appropriate contract bid price for the specified unit of measure.

ITEM NO.	DESCRIPTION	UNITS
2104.601	Salvage Signal System "A"	Lump Sum
2104.601	Salvage Signal System "B"	Lump Sum
2104.601	Salvage Signal System "C"	Lump Sum

3. Removing and disposing of traffic signal foundations, traffic signal conduits, and handholes containing asbestos shall **not** be paid for separately but shall be included in the lump sum price per system.

SS-2

(2565) TRAFFIC CONTROL INTERCONNECTION

This work shall consist of installing all materials and equipment as shown on the Plans, to provide a complete, operating communication line between the following traffic signal control systems:

Interconnection of Systems "A" through "C" to each other, and along Lyndale Avenue S, and along 54th Street and installing or removing and reinstalling interconnect to other signal systems as shown on the Plans.

The electrical system shall comprise all of the work shown in the Plans including, but not limited to, installing the conduit, handholes and interconnect cable into the controller cabinets via handholes and conduits, and removal of the in-place communication cable, all in accordance with the Specifications, except as shown or noted in the Plans and modified in these Special Provisions.

SS-2.1 Materials

A. (2565.603) 12 Pair Conductor, Number 19

Communication cable shall be a 12 Pair conductor, No. 19 AWG Cable as noted in the Plans. The cable shall be a multi-conductor, grease-filled, telephone cable designed for conduit and direct burial application.

The cable shall be double jacketed and conform to a modified version of the requirements of Rural Utilities Service (RUS) Specification 1755.390 latest edition. The specification modification consists of provision of double jacketing with the inner and outer jackets constructed in conformance with the requirements of ANSI/ICEA S-84-608-1988 paragraph 7.1 and 7.2.

Individual conductors shall be solid and No. 19 AWG. There shall be a single shield that shall be either fully annealed solid copper, Alloy 194, or fully annealed copper-clad stainless steel.

The following summarizes the primary requirements:

1. 12 Pair No. 19 AWG.
2. The cable is fully color-coded so that each pair in the cable is distinguishable from every other pair.
3. Each conductor shall be a solid round wire of commercially pure annealed copper.
4. Each conductor shall be insulated with a colored, solid insulating grade, high-density polyethylene or crystalline propylene/ethylene copolymer.
5. The insulated conductors shall be twisted into pairs. The twisted pairs shall be assembled in such a way as to form a substantially cylindrical group (cable core).

6. A petrolatum-polyethylene filling compound shall completely coat each insulated conductor and fill the air space between the conductors.
7. The cable core shall be completely covered with a layer of non hydropscopic and non wicking dielectric material. The covering shall be applied with an overlap.
8. An inner jacket applied over the cable core covering. The jacketing grade material used for the inner jacket shall be low density, high molecular weight polyethylene in accordance with ANSI/ICEA S-84-608-1988 paragraph 7.1/7.2.
9. A single corrugated metal shield shall be applied longitudinally with an overlap over the inner jacket. The metal shield shall be for “Gopher Resistant Cable” and shall be either **10-mil fully annealed solid copper, 6-mil 194 Alloy, or 6-mil fully annealed copper clad stainless steel.**
10. An outer jacket shall be applied over the metal shield and inner jacket. The jacketing grade material used for the outer jacket shall be low density, high molecular weight polyethylene in accordance with ANSI/ICEA S-84-608-1988 paragraph 7.1/7.2.
11. The cable shall be marked on the outer jacket with product description, year of manufacture, and sequential footage marks at two-foot intervals.

The City of Minneapolis Traffic and Parking Services shall be provided the opportunity to review and approve or disapprove the proposed communications cable before it is installed.

B. Non-Metallic Conduit

Non-metallic conduit (N.M.C.) and conduit fittings shall be Type II heavy-wall rigid PVC Schedule 40 plastic conduit and conduit fittings per Mn/DOT 3803. Conduit size shall be as shown as shown in the Plans.

C. Handholes

All handholes shall be City of Minneapolis Electrical Handholes with metal frames and covers as shown in the details in the Plans (Minneapolis Detail No. 3776) and shall conform to the City of Minneapolis standards. A drain field shall be provided with each

handhole. Concrete for supporting the metal frames and covers in non-sidewalk areas shall be Mix No. 3A32 or equal.

Handholes rings and covers shall be constructed from Class 30 Grey Iron, primed with a red oxide primer, and finished with City of Minneapolis approved Green Exterior Enamel.

Relocated handhole rings and covers shall be cleaned and primed and finish painted.

SS-2.2 CONSTRUCTION REQUIREMENTS

The in-place and new communication system within the project area shall be located in in-place or new conduit as noted in the Plans. In-place communication cable shall remain in-place and in operation until such time as the in-place traffic signal systems are turned off, a roadway is closed and the various interconnect functions are no longer necessary.

A. Removal of In-place Communications Cable

Prior to removal of the existing communications system, the City of Minneapolis shall be notified so that appropriate steps may be taken to disconnect communications equipment at adjacent traffic signal installations. The communications cables shall be disconnected at each control cabinet by City forces, and with the approval of the City, may then be removed by the Contractor.

Salvaged cable shall be coiled and tagged in accordance with the requirements of SS-1.4.

B. Conduit Placement

Where N.M.C. conduits are required to be placed underground below roadway surface areas that are to be reconstructed with bituminous or concrete pavement, the N.M.C. conduit shall be placed and backfilled (if trenching method used) and compacted to the satisfaction of the Engineer before any new pavement is placed.

Exposing existing utilities and surface restoration shall be considered incidental to the work required to provide a complete conduit system installation.

The Contractor shall install red City of Minneapolis Traffic and Parking Services marking tape for marking underground transportation utilities at a distance of 6 inches above all new conduit placed by the trenching method. The required marking tape shall be

purchased by the Contractor at the City of Minneapolis Traffic and Parking Services Office, 300 Border Avenue North. Provision and installation of the marking tape by the Contractor shall be considered incidental work to furnishing and installing the conduit.

Existing Conduit to be Reused: As part of a revised traffic signal interconnect system (as shown in the Plans) shall be reused in accordance with the provisions of Mn/DOT 2565.3D5.

Extension of Conduits: The Contractor shall provide a continuous length of conduit of size and type noted on the Plans between the specified terminal points.

Installation of Conduit into Handhole: Conduits shall be installed into handholes by use of a hole saw to cut through the handhole wall. Areas surrounding conduit entrances shall be sealed by filling them with mortar. Conduits shall be installed entering handholes through the sidewalls of the handholes, not through the bottom gravel foundation. Conduits shall extend a minimum of 2 inches and no more than 3 inches into the handhole. **Signal interconnect conduit runs passing through handholes shall have both entering conduits placed in direct horizontal alignment.**

Connection to Existing Conduits: The Contractor shall locate the ends of existing conduit as shown on the Plans and extend the conduit to handhole, signal base, etc., which is to be built by the Contractor. Existing conduit shall be cut perpendicular to conduit and exterior surface cleaned to form secure connection to extension.

Installation of Conduits: The conduits shall be installed a maximum of 12 inches from the back of the curb, as shown in the Plans or as directed by the Engineer. Except as required to bypass foundations, the base on which the curb is placed shall not be disturbed. All conduits installed across newly surfaced streets shall be installed at a minimum depth of 24 inches or as directed by the Engineer.

Where existing sidewalks, pavement, or streets are opened, the opening shall be refilled to the original thickness using material equal to that removed, and the surface restored. In sidewalk areas whole panels shall be removed and replaced unless a utility joint exists in which case only the portion of the walk above the installation up to the joint need be removed and replaced.

In general, all conduits shall be straight and true, and all offsets and bends shall be uniform and symmetrical. Field bends of conduit shall only be accomplished with the use of an approved conduit

heating/bending mechanism designed for that purpose. The Contractor shall adjust the elevations of the conduit assembly for its full length to approximately the same gradient as the finished roadway, and shall furnish and install, in the trench such suitable spacers and framing as may be necessary to maintain the correct grade and alignment. The cover material shall be firmly tamped into place in 6-inch lifts to minimize uneven settlement above or below the conduit

Installation of Conduits Under Driving Surface and Sidewalk: All conduits that are to be placed under driveways, streets and sidewalk that are not scheduled for removal shall be directional bored, or installed by another method approved by Engineer that will not damage or disturb the integrity of the driveway, street or sidewalk. All conduits that are to be placed under driveways, alleys, streets, or sidewalk that are scheduled for removal must be placed during the time between the removal of the existing surface and the commencement of pavement operations. The Contractor is responsible for coordination with the paving Contractor.

Installation of Conduits Under Driving Surface and Sidewalk Outside Paving Limits: All conduits that are placed under driveways, streets and sidewalk that are not scheduled for removal as part of the street or sidewalk paving shall be placed either by directional boring, surface removal or other approved methods. Any required surface removal and restoration shall be considered incidental to the work required to provide a complete conduit system installation. Damage to pavement or sidewalk shall be remedied at the Contractor's expense.

Conduit Ends in Handholes: All ends of non-metallic conduit entering a handhole shall be trimmed by the Contractor, on the inside and outside of cut ends to remove rough edges. Conduits shall extend a minimum of 2 inches and no more than 3 inches into the handhole.

C. Installation of Communications Cable

Interconnect cable runs shall be installed as continuous runs, unless splices are specified. Approximately six (6) feet of slack cable shall be provided in each handhole through which the run of interconnect cable passes. Each interconnect cable entering the controller cabinets shall provide six (6) feet of slack cable within the controller cabinet and shall be permanently labeled as "East" or "West" or "North" or "South" to identify the direction of interconnect cable run. Such

identification shall be affixed immediately on installation of the cable into the cabinet foundation. **A pull rope, approved by the City, shall be installed in each conduit along with each run of communication cable.**

SS-2.3 METHOD OF MEASUREMENT AND PAYMENT

A. Measurement

Furnishing and installing all materials to provide a complete, useable interconnect system as contained in these Special Provisions and in the Plans will be measured as described below.

Removing and salvaging the existing traffic signal interconnect system as contained in these Special Provisions and in the Plans will be measured as an integral unit as described below.

B. Payment

- The conduit, handholes, and cable system required to construct the Traffic Signal Interconnect System shall be paid for as listed below. Payment at these contract unit prices shall be compensation in full for all costs of furnishing and installing all materials and incidentals including pull rope, miscellaneous work, equipment, and materials required to provide the system as specified and as shown in the Plans.

ITEM NO.	DESCRIPTION	UNITS
2565.603	3" Non-Metallic Conduit Trenched	Lineal Foot
2565.603	12PR #19 Interconnect Filled	Lineal Foot
2565.603	Handhole Design Mpls	Each

- Payment for removing and salvaging existing traffic signal interconnect conduit, cable and handholes shall be in accordance with Mn/DOT 2565.4 and Mn/DOT 2565.5 respectively Salvage Signal System. Payment shall be compensation in full for all costs of salvaging, removing and disposing of conduit, handholes, hazardous materials, and all incidentals in accordance with the following schedule at the appropriate contract bid price for the specified unit of measure.

ITEM NO.	DESCRIPTION	UNITS
2104.601	Remove Traffic Signal Interconnect Conduit	Lump Sum

3. Removing and disposing of traffic signal conduits, and handholes containing asbestos shall not be paid for separately but shall be included in the lump sum price per system.

APPENDIX A

City of Minneapolis

ASBESTOS ABATEMENT

Removal/Replacement of Concrete Pole Bases, Concrete Encased Conduit, and Handholes that Contain Asbestos

Some Minneapolis signal and streetlight bases, pipe contain asbestos-containing (Transite) electrical conduit which can be broken during the removal and replacement of a streetlight or signal pole foundation. Some Minneapolis style handholes also have asbestos pipe used in the vertical pipe section of the handhole. Asbestos release can be controlled by wetting the concrete base and Transite before and during removal and painting encapsulant on any broken Transite edges exposed during the foundation removal/replacement process.

Equipment needed:

- Garden sprayer filled with amended water(water/surfactant mixture – dish washing detergent can be used as a surfactant, use 1 oz./gallon of water)
- Bucket of Childers CP-11 mastic – available at plumbing supply stores
- Disposable paint brush

Training needed:

- OSHA requires that workers who disturb asbestos-containing materials must get Class III training. A four-hour session, which includes hands-on training, will meet this OSHA requirement.

Procedures:

After the base is excavated, look at the conduit to determine if it is Transite. Transite is a rock hard, gray, slate-like material. Gray PVC pipe was also used as conduit. The PVC pipe requires no special precautions.

When removing wiring, make sure system is completely de-energized. If Transite conduit is present, spray the inside of the conduit and wiring with amended water. Pull the wires out of the conduit. If wires are visibly contaminated, wipe down the wires with disposable wipes.

If the base will be hoisted out of the ground in one piece, paint the exposed Transite

conduit with CP-11 and spray amended water inside the conduit. If the base breaks during removal and Transite is exposed, wet the broken areas with amended water. When the base is moved, paint any newly exposed Transite areas with CP-11.

If the base will be broken apart and partially removed, wet the exposed Transite and inside surfaces of conduit with amended water.

When base breaks, immediately spray the newly exposed Transite surfaces with amended water. Paint the exposed Transite surfaces on the removed portion of the base with CP-11.

For the portion which remains in the ground, wet all exposed Transite. It is very important to wet the portion of conduit where any PVC/Steel adapters will be inserted. Carefully set the adapter and paint the Transite and adjacent portions of the adapter with CP-11. Paint any other exposed portions of Transite with CP-11.

Carefully haul removed bases and portions of bases to an area where they can be stored and kept separate from any other concrete which could be recycled.

Asbestos-containing material must not be recycled because crushing this material will release asbestos fibers into the air and also introduce asbestos into the recycled concrete aggregate.

The material which contains Transite conduit must be disposed of at a landfill which accepts asbestos-containing materials. This material can be legally placed in a demolition landfill, but some landfills do not accept asbestos. Call to insure acceptance.