COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
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Andy Beshear
GOVERNOR

Jim Gray
SECRETARY

MAINTENANCE MEMO NO. 01-22, TRAFFIC OPERATIONS MEMO NO. 01-22

TO: Chief District Engineers
Branch Managers for Engineering Support
Branch Managers for Project Delivery and Preservation

FROM: Joshua Rogers, P.E.
Director
Division of Maintenance

Tim Tharpe, P.E.
Director
Division of Traffic Operations

DATE: May 13, 2022

SUBJECT: Traffic Signal Loops in Proposal Projects

The purpose of this memorandum is to provide updated guidance on the replacement of traffic signal loops that are impacted by proposal projects (such as resurfacing, rehabilitation, HSIP projects, etc.). This document addresses the role of various Branches in estimating the bid items and quantities for this work and what type of information should be included in the project documents. In addition, this document clarifies when to use traditional traffic signal loops and when to use preformed loops. We have also added alternative radar/video detection as an option instead of loops. The use of alterative detection will be the decision of the District Traffic Supervisor. Hopefully, this guidance will help ensure that traffic loops/detection are replaced in an efficient manner.

If a proposal project impacts traffic signal loops, bid items and quantities for loop replacement should be included in the project. If loops are included in the project, it is recommended that the project documents include intersection layouts and/or a chart with the number and types of all loops required. An example of such documentation is attached for your consideration. Determination of whether to include loop work in projects and determination of bid items and associated quantities should be a collaborative effort between the Project Manager and the District Traffic Engineer.

Special Note 1-3892 shall be added to the project documents for traditional loop wire detection, and Special Note 1-3895 shall be added to the project documents for preformed detection. Refer to

Subsection 723.03.17 – "Loop Installation on Pavement Rehabs" in the Kentucky Standard Specifications.

Asphalt Pavements:

For projects involving asphalt pavement, loops should be tested for functionality per Subsection 723.03.20 of the Kentucky Standard Specifications. If loops do not meet the specification requirements, the damaged loops should be replaced with traditional loop wire detection. On asphalt pavement projects, the following bid items should be used to address traffic signal loops that are impacted:

Code	Pay Item	Pay Unit
4792	Conduit 1"	Linear Foot[1]
4820	Trenching and Backfilling	Linear Foot[1]
4830	Loop Wire	Linear Foot[1]
4850	Cable-No. 14/1 Pair	Linear Foot[1]
4895	Loop Saw Slot and Fill	Linear Foot[1]
24963ED	Loop Test	Each[1]
24955ED	Remove Signal Equipment	Each

[1] *Note: Always used when installing loops with asphalt resurfacing.*

4811	Electrical Junction Box Type B	Each[2]
24900EC	PVC Conduit - 1 ¼ inch – sch 80	Linear Foot[2]
24901EC	PVC Conduit – 2 inch- sch 80	Linear Foot[2]

[2] *Note: Needed if 1-Pair Cable cannot be removed from existing conduit. We suggest that a minimum quantity be bid just in case.*

4795	Conduit 2"	Linear Foot[3]
21543EN	Bore and Jack Conduit	Linear Foot[3]
4821	Open Cut Roadway	Linear Foot[3]
4960	Remove and Replace Sidewalk	SQYD[3]

[3] *Note: Needed if loop conduits are crossing under roadway surfaces, GES loops or sidewalks. Rigid Steel is required under all roadway surfaces.*

The items in the above list should be the only bid items necessary to install loops. Descriptions of each bid item, including guidance on calculation of quantities, are as follows:

- Conduit 1" (4792) - is rigid steel conduit and is used to house the loop wire (maximum of six wires) from the saw slot to the junction box/pedestal/pole/cabinet where it is then spliced to the lead-in cable (4850). This quantity is from the roadway saw cut to the junction box/pedestal/pole.

- PVC Conduit 1 ¼" (24900EC) - is used to house lead-in cable (maximum of three cables) from the junction box to the pole/pedestal/cabinet. This quantity is from the pole/cabinet/pedestal to the junction box near the loop.

- PVC Conduit 2" (24901EC) - is used to house lead-in cable (maximum of eight cables) from the junction box to the pole or cabinet. This quantity is from the pole/cabinet/pedestal to the first junction box for a GES installation.

- Conduit 2" (4795) - is rigid steel conduit and is only used for crossings under the roadway surface. This quantity is usually conduit that goes under roadway/driveways for GES installations.

- Trenching and Backfilling (4820) - is used for installing conduit and should equal the combined quantity of all conduit quantities. This quantity is usually equal to the conduit quantity minus the distance for Bore and Jack/Open Cut Roadway. If several conduits are placed within the same trench, the quantity should be equal to one times the distance between the junction box, pole, or cabinet.

- Loop Wire (4830) - is installed in the saw slot and inside 1" Conduit. 6' x 30' quadrapole loops are typically located at the stop bar. 6' x 6' loops are typically set back from the stop bar, typically at a distance of 50 feet for normal mainline detection or at a distance of approximately 200 to 400 feet for Green Extension (GES) loops. Each 6' x 30' quadrapole loop will have a total quantity of 264', and each 6' x 6' loop will have a total quantity of 72'. Quantities also need to be included to account for the distance from the loop through the transition from the saw slot to the junction box, pole, or cabinet. This wire is commonly referred to as the homerun. For each homerun, the distance from the loop to the junction box, pole, or cabinet will need to be multiplied by two in order to calculate the quantity of wire correctly. No splicing shall be permitted in a run of loop wire. Loop wire shall only be spliced to lead-in cable. Splicing of loop wire to lead-in cable shall only be permitted in a junction box or signal/pedestal pole. All splicing materials are incidental to the bid item for loop wire.

- Cable-No. 14/1 Pair (4850) – is commonly referred to as lead-in cable and is installed from the controller to the junction box/pole where the loop wire ends. No splicing shall be permitted in a run of lead-in cable. Lead-in cable shall only be spliced to loop wire. Splicing of loop wire to lead-in cable shall only be permitted in a junction box or signal/pedestal pole. All splicing materials are incidental to the bid item for cable. This quantity is usually from the cabinet up the nearest pole (32 foot) and then across the signal and down this pole (32 foot) to each junction box/pole/pedestal that is feeding the loop. This quantity will be increased per each loop that is installed to the junction box/pole/pedestal.

- Loop Saw Slot and Fill (4895) – is installed in the surface of the existing road prior to resurfacing or after the milling but before the overlay. One 6' x 30' loop will have a total quantity of 102' of loop saw slot and fill, and one 6' x 6' loop will have a total quantity of 24' of loop saw slot and fill. The distance from the loop to a point nine to twelve inches from the curb or shoulder will need to be included in your quantity for this bid item. One saw slot can house three individual loop homeruns (two wires per homerun).

- Loop Test (24963ED) – is the procedure referred to in Subsection 3.1 of Special Note 1-3892. This item is used to pay the contractor to test the existing loop to see if it needs to be replaced before or after milling the surface of the asphalt pavement. Re-splicing of the loop wire to the lead-in during the testing period is incidental to this item.

- Remove Signal Equipment (24955ED) – is removing all existing wire from spans, cabinets, and poles. This also includes removing old conduit, junction boxes and restoring the original conditions at each location.

- Electrical Junction Box Type B (4811) – is installed near the shoulder to house the transition from loop wire to lead-in cable. These will only be required if the existing box needs to be replaced or if the original installation did not include one.

- Bore and Jack Conduit (21543EN) – required if conduit under a roadway crossing needs to be replaced outside of downtown areas. Bore and Jack would typically not be used in downtown areas where Open Cut Roadway should be used. This quantity is equal to the quantity of Conduit 2" that is used under a roadway/driveway.

- Open Cut Roadway (4821) – required if conduit under a roadway crossing needs to be replaced. Open Cut Roadway is only required if Bore and Jack is not possible in the location, such as downtown areas. This quantity is equal to the quantity of Conduit 2" that is used under a roadway/driveway.

- Remove and Replace Sidewalk (4960) – required if conduit or junction boxes need to be installed under existing sidewalks. If conduit goes under the sidewalk, this item should be used to install conduit. Conduit shall be used with any loop wire that is installed under sidewalk. Saw cuts are not permitted. This quantity is area that is required to install the conduit.

Concrete Pavements:

For projects involving concrete pavement, loops should be tested for functionally per Subsection 723.03.17 of the Kentucky Standard Specifications. If loops do not meet the specification requirements, the damaged loops should be replaced with preformed loops. Preformed loops should be installed prior to installation of the final surface. Preformed loops shall not be installed more than twelve inches below the elevation of the final pavement surface. Concrete joints and steel reinforcement shall be located to avoid the preformed loop installations. On concrete pavement projects, the following bid items should be used to address traffic signal loops that are impacted:

Code	Pay Item	Pay Unit
4792	Conduit 1"	Linear Foot[1]
4820	Trenching and Backfilling	Linear Foot[1]
4894	Preformed Loop/Lead-In	Linear Foot[1]
20452ES835	Preformed Loops (6X6)	Linear Foot[1]
20453ES835	Preformed Quadrapole Loops	Linear Foot[1]
4850	Cable-No. 14/1 Pair	Linear Foot[1]
4895	Loop Saw Slot and Fill	Linear Foot[1]
24963ED	Loop Test	Each[1]
24955ED	Remove Signal Equipment	Each

[1] *Note: Always used when installing loops with concrete resurfacing.*

4811	Electrical Junction Box Type B	Each[2]
24900EC	PVC Conduit - 1 ¼ inch – sch 80	Linear Foot[2]
24901EC	PVC Conduit – 2 inch- sch 80	Linear Foot[2]

[2] *Note: Needed if 1-Pair Cable cannot be removed from existing conduit. We suggest that a minimum quantity be bid just in case.*

4795	Conduit 2"	Linear Foot[3]
21543EN	Bore and Jack Conduit	Linear Foot[3]
4821	Open Cut Roadway	Linear Foot[3]
4960	Remove and Replace Sidewalk	SQYD[3]

[3] *Note: Needed if loop conduits are crossing under roadway surfaces. Rigid Steel is required under all roadway surfaces.*

The items in the above list should be the only bid items necessary to install preformed loops and to install the homerun lead-in (bid item 4894) from the loops to the junction box/pole/cabinet. Descriptions of each bid item, including guidance on calculation of quantities, are as follows:

- Conduit 1" (4792) – is rigid steel conduit used to house the homerun lead-in (4894). There is a maximum of one preformed tube from the saw slot to the junction box/pole where it is spliced to the lead-in cable (4850). This quantity is from the roadway saw cut to the junction box/pedestal/pole.

- PVC conduit 1 ¼" (24900EC) – is used to house lead-in cable (maximum of three cables) from the junction box to the pole or cabinet. This quantity is from the pole/cabinet/pedestal to the junction box near the loop.

- PVC Conduit 2" (24901EC) – is used to house lead-in cable (maximum of eight cables) from the junction box to the pole or cabinet. This quantity is from the pole/cabinet/pedestal to the first junction box for a GES installation.

- Conduit 2" (4795) – is rigid steel conduit and is only used for crossings under the roadway surface. This quantity is usually conduit that goes under roadway/driveways for GES installations.

- Trenching and Backfilling (4820) – is used for installing conduit and should equal the combined quantity of all conduit quantities. This quantity is usually equal to the conduit quantity minus the distance for Bore and Jack/Open Cut Roadway. If several conduits are placed within the same trench, the quantity should be equal to one times the distance between the junction box, pole, or cabinet.

- Preformed Loop/Lead-In (4894) - is installed from the nearest corner of the preformed loop (20452ES835 or 20453ES835) through the transition from the saw slot to the junction box/pole/cabinet. The nearest corner is defined as the corner of the loop that is closest to the location where the lead-in cable (4850) is to be spliced with the preformed loop/lead-in. The quantity shall be equal to one times the distance between the nearest corner of the loop to the location where it is spliced to the lead-in cable.

- Preformed Loops (20452ES835) - are 6' x 6' loops that are installed set back from the stop bar, typically at a distance of 50 feet for normal mainline detection or at a distance of approximately 200 to 400 feet for Green Extension loops. One 6' x 6' loop will have a total quantity of 24'.

- Preformed Quadrapole Loops (20453ES835) - are 6' x 30' loops that are placed at the stop bar. One 6' x 30' loop will have a total quantity of 102'.

- Cable-No. 14/1 Pair (4850) – is commonly referred to as lead-in cable and is installed from the controller to the junction box/pole where the Preformed Loop/Lead-In ends. No splicing shall be permitted in a run of Lead-In cable. Lead-In cable shall only be spliced to Preformed Loop/Lead-In. Splicing of Lead-In cable to Preformed Loop/Lead-In shall only be permitted in a junction box or signal pole. All splicing materials are incidental to the bid item for cable. This quantity is usually from the cabinet up the nearest pole (32 foot) and then across the signal and down this pole (32 foot) to each junction box/pole/pedestal that is feeding the loop. This quantity will be increased per each loop that is installed to the junction box/pole/pedestal..

- Loop Saw Slot and Fill (4895) – is installed in the surface of the existing road prior to resurfacing or after the milling but before the overlay. One 6' x 30' loop will have a total quantity of 102' of loop saw slot and fill, and one 6' x 6' loop will have a total quantity of 24' of loop saw slot and fill. The distance from the loop to a point nine to twelve inches from the curb or shoulder will need to be included in your quantity for this bid item. One saw slot can house three individual loop homeruns (two wires per homerun).

- Loop Test (24963ED) – is the procedure referred to in Subsection 3.1 of Special Note 1-3895. This item is used to pay the contractor to test the current loop to see if it needs to be replaced before or after milling the surface of the concrete pavement. Re-splicing of the loop wire to the lead-in during the testing period is incidental to this item.

- Remove Signal Equipment (24955ED) – is removing all existing wire from spans, cabinets, and poles. This also includes removing old conduit, junction boxes and restoring the original conditions at each location.

- Electrical Junction Box Type B (4811) – is installed near the shoulder to house the transition from loop wire to lead-in cable. These will only be required if the existing box needs to be replaced or if the original installation did not include one.

- Bore and Jack Conduit (21543EN) – required if conduit under a roadway crossing needs to be replaced outside of downtown areas. Bore and Jack would typically not be used in downtown areas where Open Cut Roadway should be used. This quantity is equal to the quantity of Conduit 2" that is used under a roadway/driveway.

- Open Cut Roadway (4821) – required if conduit under a roadway crossing needs to be replaced. Open Cut Roadway is only required if Bore and Jack is not possible in the location, such as downtown areas. This quantity is equal to the quantity of Conduit 2" that is used under a roadway/driveway.

- Remove and Replace Sidewalk (4960) – required if conduit or junction boxes need to be installed under existing sidewalks. If conduit goes under the sidewalk, this item should be used to install conduit. Conduit shall be used with any loop wire that is installed under sidewalk. Saw cuts are not permitted. This quantity is area that is required to install the conduit.

Radar Detection Alternative:

For projects involving concrete or asphalt pavements, radar can be used for stopbar and advance detection and will be provided via our KYTC contract (materials only). We have developed an Excel spreadsheet to help with the install list for these materials. Request this spreadsheet from Ted Swansegar or any other employee in the Design Services Branch in Central Office Traffic Operations. On alternative detection projects, the following bid items should be used to address traffic signal loops that are impacted:

Code	Pay Item	Pay Unit
24119EC	Install Radar Presence Detector Type A	Each[1]
26120EC	Install Radar Advance Detector Type B	Each[1]

[1] *Note: Always used when installing Radar.*

The items in the above list should be the only bid items necessary to install radar detection. The Install List and the Project Release Install List are also required documents. The Install List cost shall be added to the cost of the project, but not included in the engineer's estimate. The Project Release Install List shall be added to the Proposal. The Resident Engineer shall contact District Traffic when the project is awarded so that they can purchase the radar. It usually takes two weeks to get the materials. The Install List and Project Release Install List can be found here:

https://transportation.ky.gov/TrafficOperations/Pages/Design-Services-Branch-Standards-and-Tools.aspx

Descriptions of each bid item, including guidance on calculation of quantities, are as follows:

- Install Radar Presence Detector Type A – required if stopbar loops need to be replaced. There will be one per approach. This includes left, through, and right turn loops. If 50' setback loops are used, they will be included in this item.
- Install Radar Advance Detector Type B – required if GES loops need to be replaced. There will be one per approach. This includes GES loops from 240 to 400 foot behind the stopbar.. Typically not required on side streets.

Below are the required bid notes to be added to the proposal:

- *Install Radar Presence Detector Type A* – shall consist of installation of a pole mounted radar presence sensor, sensor mounting bracket, sensor cables, interface boxes, lead-in cable, connectors (furnished by contractor), and controller interface assembly. Radar Presence Detector Type A bid item shall include all labor required to provide a functional detection system. Radar Presence Detector Type A shall be installed and wired in accordance with the manufacturer's instructions. After the detector is installed and before the detector is powered on, the contractor shall coordinate with District Traffic representatives to schedule a time to perform the detector setup. The contractor shall double check to verify that all wiring is correctly installed and connected before scheduling the detector setup work. Representatives from KYTC and/or the manufacturer or sales representative should assist with setup and calibration. The contractor shall provide a bucket truck and operators at this time for final aiming of the sensors. The contractor shall provide individuals capable of operating the setup software and learning the setup process so that future installations may be completed without assistance from others. This includes the removal of all existing loop lead-in cable from cabinet, poles, and spans. All loops, conduits and junction boxes can be abandoned in the ground.

- *Install Radar Advance Detector Type B* – shall consist of installation of a pole mounted radar presence sensor, sensor mounting bracket, sensor cables, interface boxes, lead-in cable, connectors (furnished by contractor), and controller interface assembly. Radar Advance Detector Type B bid item shall include all labor required to provide a functional detection system. Radar Advance Detector Type B shall be installed and wired in accordance with the manufacturer's instructions. After the detector is installed and before the detector is powered on, the contractor shall coordinate with District Traffic representatives to schedule a time to perform the detector setup. The contractor shall double check to verify that all wiring is correctly installed and connected before scheduling the detector setup work. Representatives from KYTC and/or the manufacturer or sales representative should assist with setup and calibration. The contractor shall provide a bucket truck and operators at this time for final aiming of the sensors. The contractor shall provide individuals capable of operating

the setup software and learning the setup process so that future installations may be completed without assistance from others. This includes the removal of all existing loop lead-in cable from cabinet, poles, and spans. All loops, conduits and junction boxes can be abandoned in the ground.

Video Detection Alternative:
For projects involving concrete or asphalt pavements, video can be used for stopbar and advance detection and will be provided via our KYTC contract (materials only). The District Traffic Supervisor or Central Office Design Services liaison can help with the material cost estimate for video detection. On alternative detection projects, the following bid items should be used to address traffic signal loops that are impacted:

Code	Pay Item	Pay Unit
20275EC	Install Video Camera	Each[1]

[1] *Note: Always used when installing Radar.*

The items in the above list should be the only bid items necessary to install video. You will also need the Install List and the Project Release Install List. The Project Release Install list shall be added to the Proposal. The Install List cost shall be added to the cost of the project, but not included in the engineer's estimate. The Resident Engineer shall contact District Traffic when the project is awarded so that they can purchase the radar. It usually takes two weeks to get the materials. The Install List and Project Release Install List can be found here:

https://transportation.ky.gov/TrafficOperations/Pages/Design-Services-Branch-Standards-and-Tools.aspx

Descriptions of each bid item, including guidance on calculation of quantities, are as follows:

- Install Video Detection – required if stopbar or GES loops need to be replaced. There will be one type of detection area per approach. Detection areas include stop and GES types. For stopbar detection areas, this includes left, through, and right turn loops, and 50' setbacks. Loops 240 to 400 feet from the stopbar will be considered GES loops.

Below are the required bid notes to be added to the proposal:

- Install Video Camera – The Department will measure the quantity as each individual unit installed. The Department will not measure installation of specified video cameras, video modules, or mounting brackets as shown on the detail sheet and will consider these incidental to this item of work. The Department will not measure furnishing and installing truss type arm (if necessary), power cable, coaxial cable, or any hardware necessary for proper installation and will consider these incidental to this item of work. Contractor shall notify the resident engineer when installation is complete for placement of detection zones.

If you have any questions regarding the contents of this memorandum, please contact the Design Services Branch in the Division of Traffic Operations at 502-564-3020.

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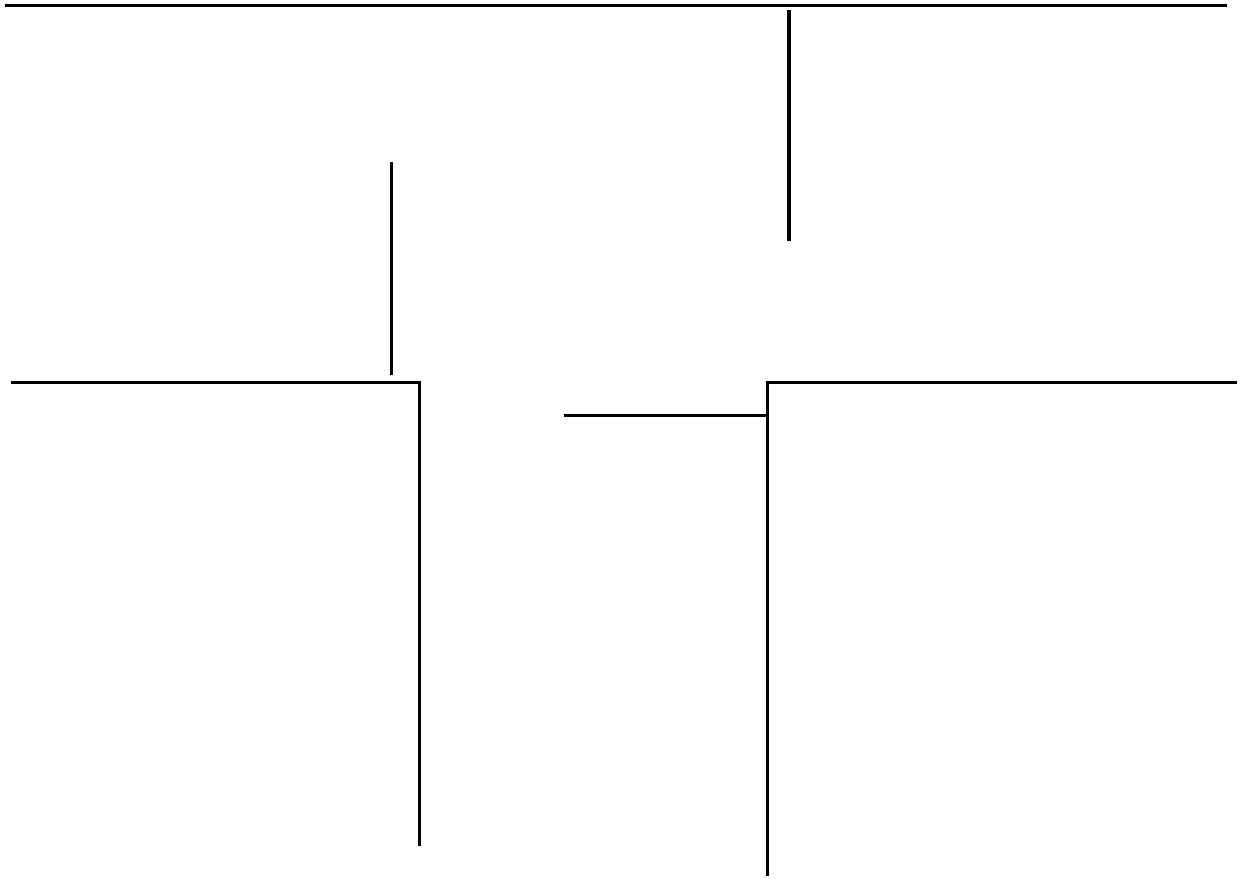

KEY

- Steel Strain Pole
- Wood Pole
- Base Mounted Controller
- 6'x30' loop
- 6'x6' loop
- Junction Box

Bid item code	Bid item	Unit	EB Approach	WB Approach	NB Approach	SB Approach	Total
4830	Loop Wire	LF					
4850	Cable No. 14/1 pair	LF					
4895	Loop saw slot and fill	LF					
4792	Conduit 1” (RS)	LF					
24900EC	PVC Conduit (1 ¼”) sch 80	LF					
24901EC	PVC Conduit (2”) sch 80	LF					
4795	Conduit 2” (RS)	LF					
4820	Trenching & Backfilling	LF					
4821	Open cut	LF					
21543EN	Bore & Jack Conduit	LF					
4811	Junction Box Type B	EA					
24963ED	Loop Test	EA					
24955ED	Remove Signal Equipment	EA					
4960	remove and replace sidewalk	SQYD					

COMMENTS:

NOTE:

1. **Quantities are for estimating purposes only. The Contractor shall field measure and inspect items to verify quantities.**
2. **2 - 1 1/4 inch conduits may be used in place of 2" conduit. Field verify conduit to match existing facilities/tie-in to poles/cabinets. Specifications.**
3. **Only replace existing conduit if damaged.**
4. **Provide As-builts to District 7 Traffic.**

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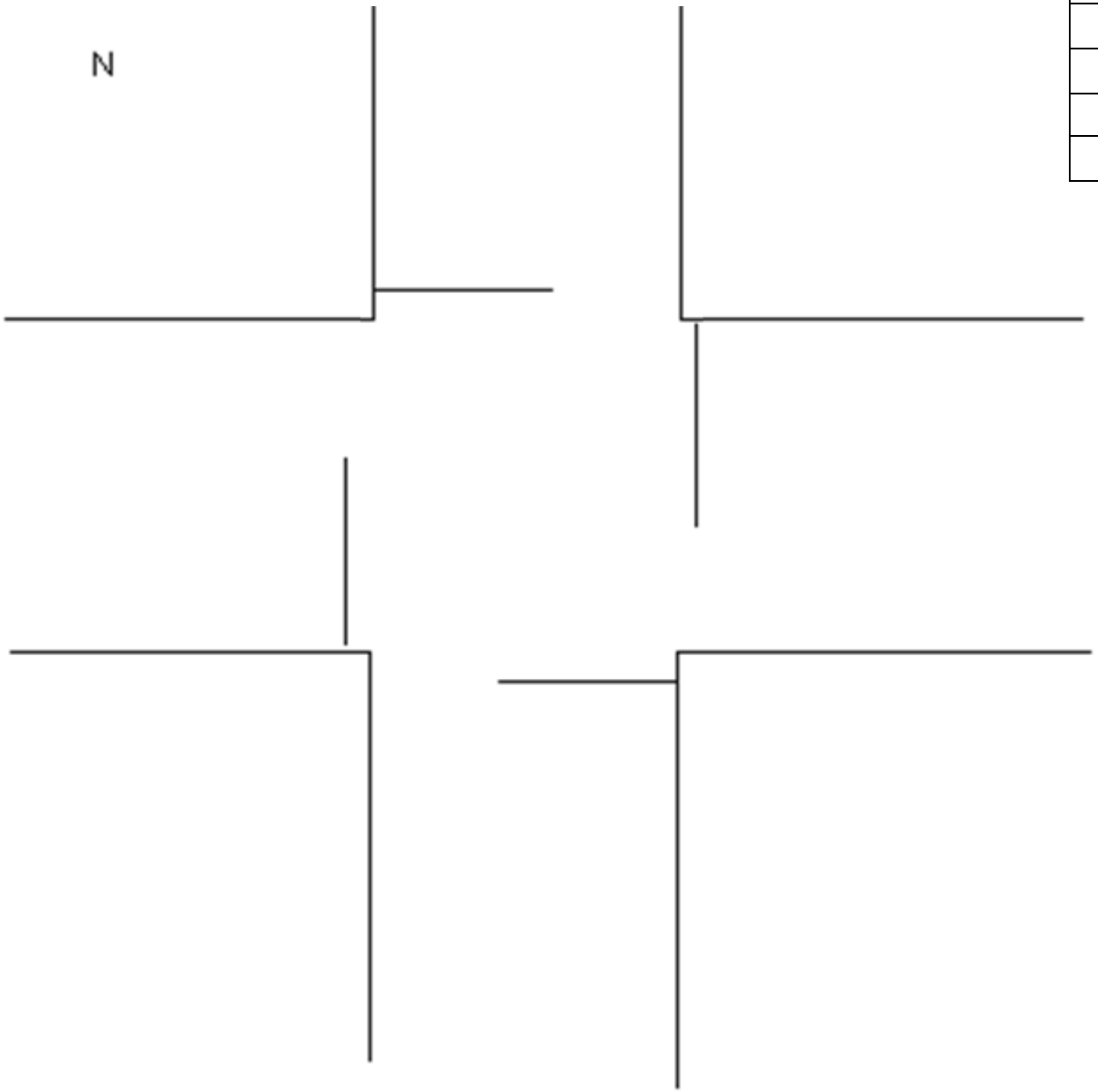

KEY

- Steel Strain Pole
- Wood Pole
- Base Mounted Controller
- 6'x30' loop
- 6'x6' loop
- Junction Box

Bid item code	Bid item	Unit	EB Approach	WB Approach	NB Approach	SB Approach	Total
4830	Loop Wire	LF					
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24901EC	PVC Conduit (2”) sch 80	LF					
4795	Conduit 2” (RS)	LF					
4820	Trenching & Backfilling	LF					
4821	Open cut	LF					
21543EN	Bore & Jack Conduit	LF					
4811	Junction Box Type B	EA					
24963ED	Loop Test	EA					
24955ED	Remove Signal Equipment	EA					
4960	remove and replace sidewalk	SQYD					

COMMENTS:

NOTE:

1. **Quantities are for estimating purposes only. The Contractor shall field measure and inspect items to verify quantities.**
2. **(2) - 1 1/4 inch conduits may be used in place of 2" conduit. Field verify conduit to match existing facilities/tie-in to poles/cabinets. See specifications.**
3. **Only replace existing conduit if damaged.**
4. **Only replace damaged junction boxes.**
5. **Provide As-built drawings to District 7 Traffic.**