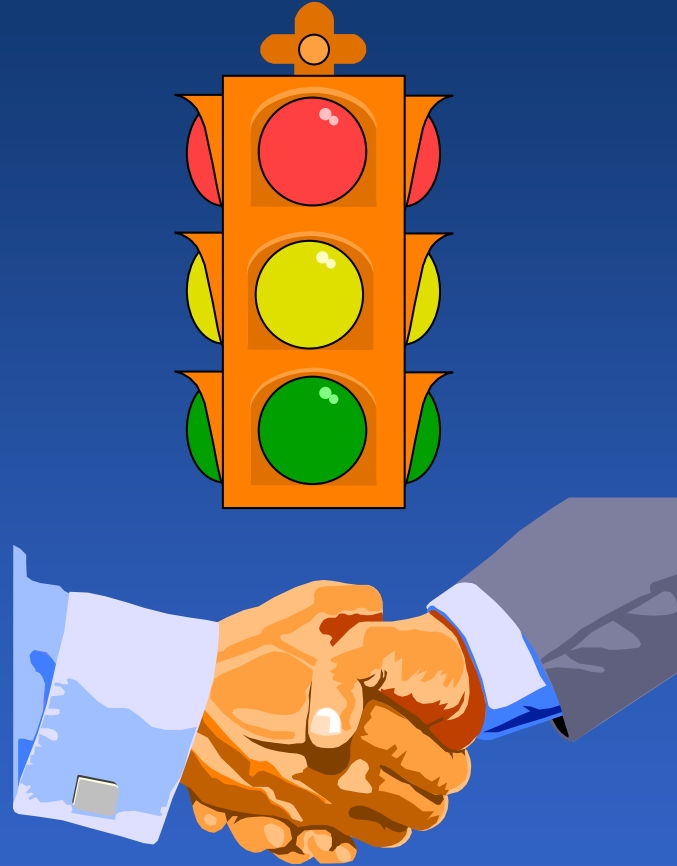


# Municipal Maintenance Agreement Traffic Signals - Schedule C

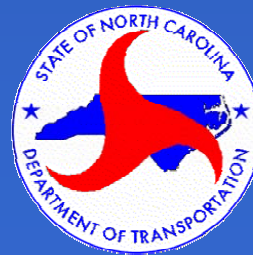


**Milton I. Dean, PE**



# **TRAFFIC SIGNAL MAINTENANCE** **MANAGEMENT PROGRAM**

- **Developed by Departmental committee**
- **Established performance maintenance standards applicable to both NCDOT and municipal agencies**



# TRAFFIC SIGNAL MAINTENANCE MANAGEMENT PROGRAM

## Three Elements:

- Emergency Maintenance (EM)
- Preventive Maintenance (PM)
- Bench Maintenance (BM)

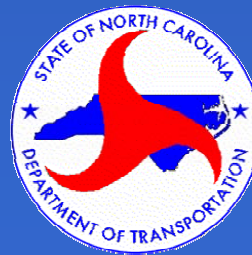


## **Good Level of Service**

### **Emergency Maintenance**

#### **Maximum Response Times:**

- **Trouble calls - 4 hours**
- **Knockdowns - 4 hours**
- **Absence of signal indication - 24 hours**
- **Replacement of inoperative loops - 30 calendar days**

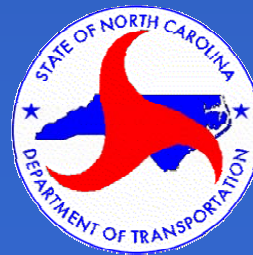


**Good Level of Service**

**Preventive Maintenance**

**Visit the Intersection Every 6 Months:**

- **Verify programming parameters in equipment**
- **Verify proper operation of all signal control components**
- **Verify proper operation of detection devices**
- **Verify proper operation of communication equipment**

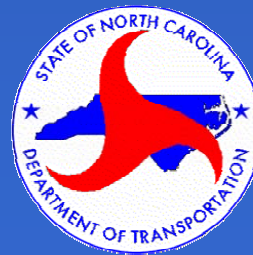


## **Good Level of Service**

### **Preventive Maintenance**

**Visit the Intersection Every 12 Months:**

- **Inspect electrical supply, grounding systems, and all wiring for damage or loose connection**
- **Inspect replaceable components for excessive wear, corrosion, proper operation**
- **Replace conflict monitor with bench-tested unit**
- **Inspect and clean traffic signal heads and lighted signs**
- **Inspect traffic signal support structures**



## **Good Level of Service**

### **Bench Maintenance**

- **Repair equipment in a timely manner to support emergency and preventive maintenance needs**
- **Upgrade equipment firmware as appropriate to address items affecting operational efficiency and safety**
- **Certify the proper operation of conflict monitors/malfunction management units**

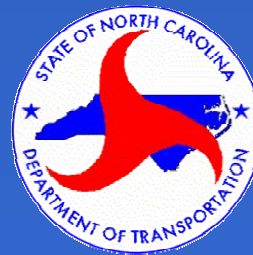


# Schedule C Municipal Maintenance Agreement

## TYPES OF REIMBURSEMENT

Annualized - An annual amount paid in quarterly payments which reimburses the agency for work to be completed within the fiscal year

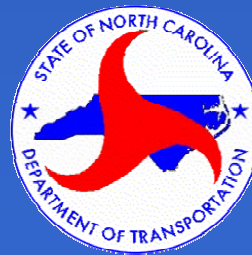
Lump Sum - An amount paid to cover the material and/or installation costs of items which are not covered in the annualized reimbursement schedule



# **Schedule C Municipal Maintenance Agreement**

## **Annualized Reimbursements:**

- Emergency Maintenance**
- Preventive Maintenance**
- Bench Maintenance**

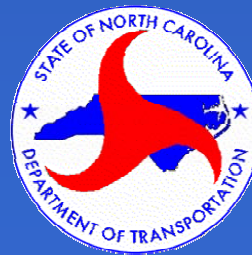


# **Schedule C Municipal Maintenance Agreement**

## **Lump Sum Reimbursements:**

### **Items used in:**

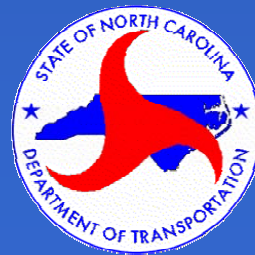
- Emergency Maintenance**
- Preventive Maintenance**
- Bench Maintenance**



# Schedule C Municipal Maintenance Agreement

## Revision to Reimbursement Rates

- Requested by Division Operation Engineers
- Recommended for next renewal period, beginning July 1, 2004
- Includes 3% inflation factor for most items
- Includes other revisions resulting from specification changes



**MUNICIPAL MAINTENANCE AGREEMENT - TRAFFIC CONTROL DEVICES  
SCHEDULE C - SIGNALS - LEVEL C (Page1)**

The Board of Transportation will reimburse the Municipality for maintenance of traffic signals on the following schedule.

Place a check beside the value for each maintenance function(s) the Municipality agrees to perform under any line item if all maintenance functions are not selected.

Place a check beside the value under "Total Maintenance" if the Municipality is to perform all maintenance functions for any line item.

| <u>Item</u>                                                                          | <u>Emergency Maintenance</u>     | <u>Preventive Maintenance</u>     | <u>Bench Maintenance</u>          | <u>Total Maintenance</u>            |
|--------------------------------------------------------------------------------------|----------------------------------|-----------------------------------|-----------------------------------|-------------------------------------|
| A. Vehicular Signal Section(Average of 10 heads/int. or 30 section/int.)             | <input type="checkbox"/> \$1.19  | <input type="checkbox"/> \$9.65   |                                   | <input type="checkbox"/> \$10.84    |
| B. Pedestrian Signal Head(Average of 4 heads/int.)                                   | <input type="checkbox"/> \$2.98  | <input type="checkbox"/> \$19.84  |                                   | <input type="checkbox"/> \$22.82    |
| C. Fiber-Optic or LED Blank-out Sign                                                 | <input type="checkbox"/> \$11.91 | <input type="checkbox"/> \$11.91  |                                   | <input type="checkbox"/> \$23.82    |
| D. Pretimed Electronic Controller/Cabinet                                            | <input type="checkbox"/> \$71.42 | <input type="checkbox"/> \$130.93 | <input type="checkbox"/> \$216.30 | <input type="checkbox"/> \$418.65   |
| E. 2-8 Assigned Phase Actuated Controller/Cabinet                                    | <input type="checkbox"/> \$71.42 | <input type="checkbox"/> \$476.11 | <input type="checkbox"/> \$257.50 | <input type="checkbox"/> \$805.03   |
| F. 2-8 Assigned Phase Actuated Controller/Cabinet with Machine-vision Detection      | <input type="checkbox"/> \$71.42 | <input type="checkbox"/> \$476.11 | <input type="checkbox"/> \$772.50 | <input type="checkbox"/> \$1,320.03 |
| G. Flashing Beacon Controller/Cabinet                                                | <input type="checkbox"/> \$11.90 | <input type="checkbox"/> \$119.03 |                                   | <input type="checkbox"/> \$130.93   |
| H. Travel Costs for Preventive Maintenance at Signalized Intersections(not Flashers) |                                  | <input type="checkbox"/> \$59.51  |                                   | <input type="checkbox"/> \$59.51    |

3%

| <u>Item</u>                                                                                          | <u>Lump Sum Payment</u>                            |
|------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| AA. Replace Loop(includes labor, materials, and other costs for sawcutting and sealing) <sup>1</sup> | <input type="checkbox"/> \$4.64 per foot of sawcut |
| AB. Furnish and install Lead-in Cable                                                                | <input type="checkbox"/> \$1.55 per foot installed |
| AC. Furnish Single Channel Loop Detector Unit <sup>2</sup>                                           | <input type="checkbox"/> \$103.00                  |
| AD. Furnish Two-Channel Loop Detector Unit <sup>2</sup>                                              | <input type="checkbox"/> \$164.80                  |
| AE. Furnish and install Pull Box                                                                     | <input type="checkbox"/> \$154.50                  |

3%



MUNICIPAL MAINTENANCE AGREEMENT - TRAFFIC CONTROL DEVICES  
 SCHEDULE C - SIGNALS - LEVEL C (Page 2)

|                                                                  |                          |                           |
|------------------------------------------------------------------|--------------------------|---------------------------|
| AF. Furnish and install Pull Box Cover                           | <input type="checkbox"/> | \$56.65                   |
| AG. Furnish and install Conduit                                  | <input type="checkbox"/> | \$3.61 per foot installed |
| AH. Furnish and install Riser                                    | <input type="checkbox"/> | \$206.00                  |
| AI. Furnish and install 35-foot Class 3 Wood Pole <sup>2</sup>   | <input type="checkbox"/> | \$546.00                  |
| AJ. Furnish and install 40-foot Class 3 Wood Pole <sup>2</sup>   | <input type="checkbox"/> | \$603.00                  |
| AK. Furnish and install Guy/Anchor Assembly                      | <input type="checkbox"/> | \$206.00                  |
| AM. Furnish and install Audible Pedestrian Signal <sup>2</sup>   | <input type="checkbox"/> | \$412.00                  |
| AN. Furnish 12-inch 3-Section Vehicular Signal Head <sup>2</sup> | <input type="checkbox"/> | \$100.00                  |
| AO. Furnish 12-inch 4-Section Vehicular Signal Head <sup>2</sup> | <input type="checkbox"/> | \$135.00                  |
| AP. Furnish 12-inch 5-Section Vehicular Signal Head <sup>2</sup> | <input type="checkbox"/> | \$220.00                  |
| AQ. Furnish 8-inch 3-Section Vehicular Signal Head <sup>2</sup>  | <input type="checkbox"/> | \$65.00                   |
| AR. Furnish 8-inch 4-Section Vehicular Signal Head <sup>2</sup>  | <input type="checkbox"/> | \$85.00                   |
| AS. Furnish 8-inch 5-Section Vehicular Signal Head <sup>2</sup>  | <input type="checkbox"/> | \$150.00                  |
| AT. Furnish Pedestrian Signal Head <sup>2</sup>                  | <input type="checkbox"/> | \$85.00                   |
| AU. Furnish LED Indication - 12-inch RED Ball <sup>2</sup>       | <input type="checkbox"/> | \$36.75                   |
| AV. Furnish LED Indication - 12-inch YELLOW Ball <sup>2</sup>    | <input type="checkbox"/> | \$48.15                   |
| AW. Furnish LED Indication - 12-inch GREEN Ball <sup>2</sup>     | <input type="checkbox"/> | \$86.90                   |
| AX. Furnish LED Indication - 12-inch RED Arrow <sup>2</sup>      | <input type="checkbox"/> | \$31.15                   |
| AY. Furnish LED Indication - 12-inch YELLOW Arrow <sup>2</sup>   | <input type="checkbox"/> | \$32.25                   |

3%



MUNICIPAL MAINTENANCE AGREEMENT - TRAFFIC CONTROL DEVICES  
SCHEDULE C - SIGNALS - LEVEL C (Page 3)

| <u>Item</u>                                                                        | <u>Lump Sum Payment</u>             |
|------------------------------------------------------------------------------------|-------------------------------------|
| AZ. Furnish LED Indication - 12-inch GREEN Arrow <sup>2</sup>                      | <input type="checkbox"/> \$52.70    |
| BA. Furnish LED Indication - 8-inch RED Ball <sup>2</sup>                          | <input type="checkbox"/> \$28.15    |
| BB. Furnish LED Indication - 8-inch YELLOW Ball <sup>2</sup>                       | <input type="checkbox"/> \$34.95    |
| BC. Furnish LED Indication - 8-inch GREEN Ball <sup>2</sup>                        | <input type="checkbox"/> \$51.60    |
| BD. Furnish and install Grounding System                                           | <input type="checkbox"/> \$231.75   |
| BE. Furnish Pretimed/Actuated Controller <sup>2</sup>                              | <input type="checkbox"/> \$1,236.00 |
| BF. Furnish Pole-Mounted Cabinet <sup>2</sup>                                      | <input type="checkbox"/> \$3,805.85 |
| BG. Furnish Base-Mounted Cabinet <sup>2</sup>                                      | <input type="checkbox"/> \$5,408.55 |
| BH. Furnish LED Blank-Out Sign <sup>2</sup>                                        | <input type="checkbox"/> \$2,000.00 |
| BI. Furnish 3-channel NEMA-Plus Conflict Monitor <sup>2</sup>                      | <input type="checkbox"/> \$223.55   |
| BJ. Furnish 6-channel NEMA-Plus Conflict Monitor <sup>2</sup>                      | <input type="checkbox"/> \$425.40   |
| BK. Furnish 12-channel NEMA-Plus Conflict Monitor <sup>2</sup>                     | <input type="checkbox"/> \$522.25   |
| BL. Furnish NEMA TS-2 Malfunction Management Unit <sup>2</sup>                     | <input type="checkbox"/> \$631.40   |
| BM. Furnish Type 2010 Conflict Monitor with Absence of Red Monitoring <sup>2</sup> | <input type="checkbox"/> \$500.00   |
| BN. Furnish Detection Camera/Sensor with Enclosure <sup>2</sup>                    | <input type="checkbox"/> \$1,545.00 |

3%

3%



MUNICIPAL MAINTENANCE AGREEMENT - TRAFFIC CONTROL DEVICES  
SCHEDULE C - SIGNALS - LEVEL C (Page 4)

| <u>Item</u>                                                                 | <u>Lump Sum Payment</u> |
|-----------------------------------------------------------------------------|-------------------------|
| BO. Perform Annual Inspection on Railroad-Interconnected Intersections      | \$186.45                |
| BP. Furnish LED Indication - 12-inch Hand                                   | \$44.90                 |
| BQ. Furnish LED Indication - 12-inch Man                                    | \$82.50                 |
| BR. Furnish LED Indication - 12-inch Hand/Man Overlay                       | \$118.75                |
| BS. Furnish LED Indication - 16-inch Hand/Man Overlay with Countdown Module | \$198.75                |

3%

<sup>1</sup> Replacement of **defective** loop with loop of identical or upgraded design requires no prior approval. Upgrading of functional rectangular loops to Quadrupole design requires prior approval from Division Traffic Engineer.

<sup>2</sup> Requires prior approval from Division Traffic Engineer for reimbursement of non-emergency replacements. If item is covered under warranty, Municipality will not be reimbursed without prior approval from Division Traffic Engineer.

**Emergency Maintenance:** This maintenance includes all labor and incidental items to bring the operation of the intersection into reasonable conformance with the existing plan of record. Reimbursements for items AA through BN and BP through BS will be given for items utilized in the completion of this work. Sufficient spare equipment must be purchased at the expense of the maintaining agency to insure all intersections are continuously operating according to the plan of record.

**Preventive Maintenance:** This maintenance includes the labor and materials as outlined in the attached Schedule of Preventive Maintenance. *Reimbursements for items AA through BN and BP through BS will be given for items utilized in the completion of this work only upon prior approval by the Division Traffic Engineer.* Where specialty equipment is not addressed specifically in the attached schedule, manufacturer's recommendations should be followed to insure continued optimum operation. Sufficient spare equipment must be purchased at the expense of the maintaining agency to allow the completion of this work.

**Bench Maintenance:** This maintenance includes labor, parts and materials to repair electronic traffic signal control components. This work typically involves in-house repair of electronic assemblies by troubleshooting and replacing specific integrated circuit chips, repairing damaged printed circuit traces, and making circuit modifications. This work includes making hardware, firmware and software upgrades to equipment to insure optimum operation. This work must be completed in a timely manner to support the emergency and preventive maintenance functions.



MUNICIPAL MAINTENANCE AGREEMENT - TRAFFIC CONTROL DEVICES  
 SCHEDULE C - SIGNALS - LEVEL C (Page 2)

|                                                                       |                          |                           |
|-----------------------------------------------------------------------|--------------------------|---------------------------|
| AF. Furnish and install Pull Box Cover                                | <input type="checkbox"/> | \$56.65                   |
| AG. Furnish and install Conduit                                       | <input type="checkbox"/> | \$3.61 per foot installed |
| AH. Furnish and install Riser                                         | <input type="checkbox"/> | \$206.00                  |
| AI. Furnish and install 35-foot <u>Class 3</u> Wood Pole <sup>2</sup> | <input type="checkbox"/> | \$546.00                  |
| AJ. Furnish and install 40-foot <u>Class 3</u> Wood Pole <sup>2</sup> | <input type="checkbox"/> | \$603.00                  |
| AK. Furnish and install Guy/Anchor Assembly                           | <input type="checkbox"/> | \$206.00                  |
| AM. Furnish and install Audible Pedestrian Signal <sup>2</sup>        | <input type="checkbox"/> | \$412.00                  |
| AN. Furnish 12-inch 3-Section Vehicular Signal Head <sup>2</sup>      | <input type="checkbox"/> | \$100.00                  |
| AO. Furnish 12-inch 4-Section Vehicular Signal Head <sup>2</sup>      | <input type="checkbox"/> | \$135.00                  |
| AP. Furnish 12-inch 5-Section Vehicular Signal Head <sup>2</sup>      | <input type="checkbox"/> | \$220.00                  |
| AQ. Furnish 8-inch 3-Section Vehicular Signal Head <sup>2</sup>       | <input type="checkbox"/> | \$65.00                   |
| AR. Furnish 8-inch 4-Section Vehicular Signal Head <sup>2</sup>       | <input type="checkbox"/> | \$85.00                   |
| AS. Furnish 8-inch 5-Section Vehicular Signal Head <sup>2</sup>       | <input type="checkbox"/> | \$150.00                  |
| AT. Furnish Pedestrian Signal Head <sup>2</sup>                       | <input type="checkbox"/> | \$85.00                   |
| AU. Furnish LED Indication - 12-inch RED Ball <sup>2</sup>            | <input type="checkbox"/> | \$36.75                   |
| AV. Furnish LED Indication - 12-inch YELLOW Ball <sup>2</sup>         | <input type="checkbox"/> | \$48.15                   |
| AW. Furnish LED Indication - 12-inch GREEN Ball <sup>2</sup>          | <input type="checkbox"/> | \$86.90                   |

**Increased \$30**

**Increased \$35**

**Reduced with  
removal of  
lens and lamp  
assembly**

**25% above bid**



MUNICIPAL MAINTENANCE AGREEMENT - TRAFFIC CONTROL DEVICES  
SCHEDULE C - SIGNALS - LEVEL C (Page 3)

| <u>Item</u>                                                                        | <u>Lump Sum Payment</u>             |
|------------------------------------------------------------------------------------|-------------------------------------|
| AZ. Furnish LED Indication - 12-inch GREEN Arrow <sup>2</sup>                      | <input type="checkbox"/> \$52.70    |
| BA. Furnish LED Indication - 8-inch RED Ball <sup>2</sup>                          | <input type="checkbox"/> \$28.15    |
| BB. Furnish LED Indication - 8-inch YELLOW Ball <sup>2</sup>                       | <input type="checkbox"/> \$34.95    |
| BC. Furnish LED Indication - 8-inch GREEN Ball <sup>2</sup>                        | <input type="checkbox"/> \$51.60    |
| BD. Furnish and install Grounding System                                           | <input type="checkbox"/> \$231.75   |
| BE. Furnish Pretimed/Actuated Controller <sup>2</sup>                              | <input type="checkbox"/> \$1,236.00 |
| BF. Furnish Pole-Mounted Cabinet <sup>2</sup>                                      | <input type="checkbox"/> \$3,805.85 |
| BG. Furnish Base-Mounted Cabinet <sup>2</sup>                                      | <input type="checkbox"/> \$5,408.55 |
| BH. Furnish LED Blank-Out Sign <sup>2</sup>                                        | <input type="checkbox"/> \$2,000.00 |
| BI. Furnish 3-channel NEMA-Plus Conflict Monitor <sup>2</sup>                      | <input type="checkbox"/> \$223.55   |
| BJ. Furnish 6-channel NEMA-Plus Conflict Monitor <sup>2</sup>                      | <input type="checkbox"/> \$425.40   |
| BK. Furnish 12-channel NEMA-Plus Conflict Monitor <sup>2</sup>                     | <input type="checkbox"/> \$522.25   |
| BL. Furnish NEMA TS-2 Malfunction Management Unit <sup>2</sup>                     | <input type="checkbox"/> \$631.40   |
| BM. Furnish Type 2010 Conflict Monitor with Absence of Red Monitoring <sup>2</sup> | <input type="checkbox"/> \$500.00   |
| BN. Furnish Detection Camera/Sensor with Enclosure <sup>2</sup>                    | <input type="checkbox"/> \$1,545.00 |

25% above bid

Increased \$400

Quote



MUNICIPAL MAINTENANCE AGREEMENT - TRAFFIC CONTROL DEVICES  
SCHEDULE C - SIGNALS - LEVEL C (Page 4)

| <u>Item</u>                                                                 | <u>Lump Sum Payment</u>           |
|-----------------------------------------------------------------------------|-----------------------------------|
| BO. Perform Annual Inspection on Railroad-Interconnected Intersections      | <input type="checkbox"/> \$186.45 |
| BP. Furnish LED Indication - 12-inch Hand                                   | <input type="checkbox"/> \$44.90  |
| BQ. Furnish LED Indication - 12-inch Man                                    | <input type="checkbox"/> \$82.50  |
| BR. Furnish LED Indication - 12-inch Hand/Man Overlay                       | <input type="checkbox"/> \$118.75 |
| BS. Furnish LED Indication - 16-inch Hand/Man Overlay with Countdown Module | <input type="checkbox"/> \$198.75 |

25% above bid

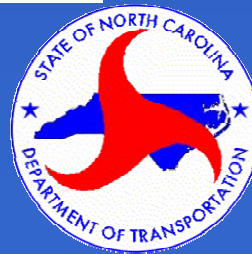
<sup>1</sup> Replacement of **defective** loop with loop of identical or upgraded design requires no prior approval. Upgrading of functional rectangular loops to Quadropole design requires prior approval from Division Traffic Engineer.

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**Bench Maintenance:** This maintenance includes labor, parts and materials to repair electronic traffic signal control components. This work typically involves in-house repair of electronic assemblies by troubleshooting and replacing specific integrated circuit chips, repairing damaged printed circuit traces, and making circuit modifications. This work includes making hardware, firmware and software upgrades to equipment to insure optimum operation. This work must be completed in a timely manner to support the emergency and preventive maintenance functions.

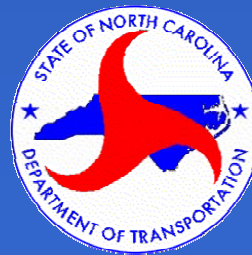


# Schedule C Municipal Maintenance Agreement

## Reporting of Preventive Maintenance Activities

### Intersection Number (Ex. 05-0100)

- Was PM completed? If partial, give details.
- Was conflict monitor replaced with certified unit?
- Were all detection devices operating properly?
- How many actuated detection channels are operating in a manual recall mode or in a permanent call status due to loop circuit problems?



# **Schedule C Municipal Maintenance Agreement**

## **Reporting of Emergency Maintenance Activities**

### **Total Number of Emergency Calls**

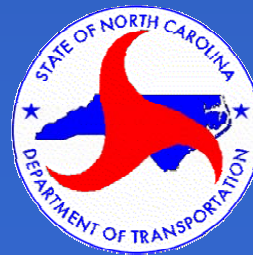
**Question: Should emergency call responses be enumerated into the categories of Items A-G in Schedule C?**



# **Schedule C Municipal Maintenance Agreement**

## **Reporting of Bench Maintenance Activities**

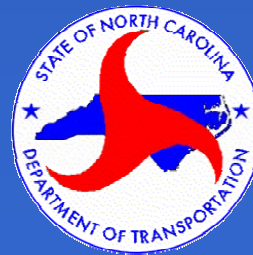
- **Total Number of Controllers Repaired**
- **Total Number of Other Signal Control Devices Repaired**



# Schedule C Municipal Maintenance Agreement

## Reporting of Lump Sum Items

- Quantity of each item used with location identified by Intersection Number
- Was item replaced as a result of **Preventive Maintenance** or **Emergency Maintenance**?



# Questions and Answers

FOR MORE INFO...

**Please contact Milton I. Dean, PE at:**

**Telephone: (919) 733-5666**

**E-MAIL: [mdean@dot.state.nc.us](mailto:mdean@dot.state.nc.us)**

