NCDOT Traffic Signal Inspection Checklist

For Acceptance of Traffic Signal Installations

(Maintained by the Transportation Systems Management and Operations Unit)

Project Number

Intersection Location

Signal Inventory No.

Inspected By

Date Inspected

DTE Office Rep.

Signal Contractor

Note: Checklist based on the 2024 Standard Specifications for Roads and Structures.

Controller Make/Model: S/N:

Cabinet Make/Type: S/N:

Conflict Monitor: S/N:

Controller Software: Ver:

Controller IP Address:

Conflict Monitor IP Address:

| **Inspection Item** | **Meets** | **Deficient** | **Not Applicable** | **Notes** |
| --- | --- | --- | --- | --- |
| **MATERIAL AND WARRANTY INFORMATION** | | | | |
| Is all material furnished new and has it been approved? (Standard Specifications 1098-1(A)) |  |  |  |  |
| Have material submittal requirements been met for all equipment used on the project? (Standard Specifications 1098-1(B)) |  |  |  |  |
| If proprietary material is required for this project, has approval been requested and granted for use of this material? |  |  |  |  |
| Are furnished materials provided with warranties? (Standard Specifications 1098-1(D))   1. Provide warranties that are customarily issued by the equipment manufacturer 2. Provide warranties that are at least 2 years in length from successful completion of the 30-day observation period 3. Provide warranties beyond the above requirements for certain materials as required by the plans and specifications |  |  |  |  |
| Has all plan of record documentation been submitted and approved? (Standard Specifications 1098-1(F)) |  |  |  |  |
| **CABINET AND CONTROLLER** | | | | |
| **CABINET AND CONTROLLER – CABINET FOUNDATIONS** | | | | |
| Has approval been obtained for the final cabinet foundation location? (Standard Specifications 1750-3(B)) |  |  |  |  |
| Has approval been obtained for the cabinet foundation type (poured concrete or preformed cabinet pad)? (Standard Specifications 1750-1) |  |  |  |  |
| Is the cabinet foundation located and installed as to allow all doors on the cabinet to open fully? |  |  |  |  |
| Is the cabinet located so as not to obstruct sight distance of vehicles turning on red? (Standard Specifications 1750-3(A)) |  |  |  |  |
| Is the cabinet foundation properly sized? Cabinet foundations shall, at a minimum, extend 24 inches from the front and back of the cabinet and 3 inches from the sides of the cabinet. (Standard Specifications 1098-16) |  |  |  |  |
| Is the cabinet foundation installed a minimum of 4 inches above and 4 inches below finished grade? (Standard Specifications 1750-3(G)) |  |  |  |  |
| Is the cabinet foundation installed as to maintain a minimum of 12 inches distance from service pole to closest point on foundation (Unless otherwise approved)? (Standard Specifications 1750-3(E)) |  |  |  |  |
| Is the cabinet attached securely to the foundation using a minimum of four ½ inch diameter expanding type anchor bolts? (Standard Specifications 1750-3(F)) |  |  |  |  |
| Is the space between the cabinet base and foundation sealed with a permanent, flexible, waterproof sealing material? (Standard Specifications 1750-3(J)) |  |  |  |  |
| Are external stubbed out conduits at the cabinet foundation located in the middle of the cabinet? (Standard Specifications 1750-3(H))   1. Is the service conduit the rightmost conduit coming into the cabinet? 2. Are two (2) spare conduits stubbed out? 3. Does one spare conduit point towards the service pole? 4. Does one spare conduit point towards the direction of the lead-in cable? 5. Are there identification arrows inscribed in the foundation indicating the direction of spare conduits? |  |  |  |  |
| Was the existing cabinet foundation enlarged in accordance with the plans and specifications? (Standard Specifications 1752-1) |  |  |  |  |
| Was the existing cabinet foundation modified according to the plans and specifications? (Standard Specifications 1752-3(B))   1. Was the ground around the existing foundation excavated to a depth sufficient to expose a minimum of 4 inches of the foundation below existing grade? 2. Were the sides of the existing foundation roughened? 3. Were the sides of the existing foundation washed and thoroughly dried? 4. Were dowels installed a minimum of 12 inches deep on 12-inch centers and epoxied into place? 5. Was a coating of approved epoxy bonding agent applied to all exposed roughened concrete surfaces as recommended by the manufacturer? 6. Is the enlarged foundation the correct size (must meet new cabinet foundation size requirements)? |  |  |  |  |
| **CABINET AND CONTROLLER – POLE MOUNTED CABINETS** | | | | |
| Is the cabinet attached securely to the pole? |  |  |  |  |
| Is the pole mounted cabinet installed so height to cabinet middle is 4 feet? (Standard Specifications 1751-3(A)) |  |  |  |  |
| **CABINET AND CONTROLLER – CABINET BASE EXTENDERS AND ADAPTERS** | | | | |
| Is a cabinet base adapter installed at locations where a new cabinet is installed on an existing or modified foundation? (Standard Specifications 1753-3) |  |  |  |  |
| Is a cabinet base extender installed at locations where a new cabinet is installed on a new foundation? (Standard Specifications 1753-3) |  |  |  |  |
| Is the cabinet base extender/adapter fabricated from the same materials and with the same finish as the cabinet housing? (Standard Specifications 1098-17) |  |  |  |  |
| Is a permanent, flexible, waterproof sealing material used to seal all spaces? (Standard Specifications 1753-3)   1. Seal between cabinet base and the cabinet base extender/adapter 2. Seal between cabinet base extender/adapter and the cabinet foundation 3. Seal between 2-piece cabinet extender/adapter seams |  |  |  |  |
| **CABINET AND CONTROLLER – CABINET** | | | | |
| Is the cabinet mounted level and plumb? |  |  |  |  |
| Is the cabinet exterior an unpainted, natural, aluminum cabinet shell (unless otherwise noted in the plans and specifications)? |  |  |  |  |
| Is the signal inventory number stenciled on the cabinet side facing the roadway in 3-inch black characters? (Standard Specifications 1751-3(A)) |  |  |  |  |
| Are the cabinet door seals weathertight? |  |  |  |  |
| Are the cabinet filters clean and replaceable? |  |  |  |  |
| Are the cabinet lights operational? |  |  |  |  |
| Is a pull-out storage shelf provided?   1. Is the storage shelf a minimum of 14x16 inches? 2. Is the storage shelf located directly below the controller and capable of supporting the controller plus 15 pounds of additional weight? 3. Does the storage shelf have a minimum 1-inch-deep storage bin with a hinged top? 4. Does the storage shelf fully extend and lock into place? |  |  |  |  |
| Are all the proper documents located in the storage drawer inside the cabinet? (Standard Specifications 1098-1(F)) (Standard Specifications 1751-3(A))   1. Cabinet prints 2. Cabinet manual 3. Conflict monitor certification 4. Complete copy of the plans including electrical details 5. Cabinet maintenance diary |  |  |  |  |
| Is the cabinet wired neatly? |  |  |  |  |
| Is the field wiring neatly arranged and routed? |  |  |  |  |
| Are the wires labeled? |  |  |  |  |
| Are all the necessary components installed per the plans? (Standard Specifications 1751-3(A))   1. Conflict monitor 2. Controller 3. Load switches 4. Flashers 5. Detector units 6. AC isolators 7. DC isolators 8. Preemption and sign control box 9. Flash transfer relays |  |  |  |  |
| Does the cabinet thermostat and fan work properly? |  |  |  |  |
| Do the detector test switches work and call the correct phase? |  |  |  |  |
| Do the police panel switches operate correctly? |  |  |  |  |
| Is the ground bus isolated from the neutral bus? |  |  |  |  |
| **CABINET AND CONTROLLER – CONTROLLER** | | | | |
| Is the controller securely mounted? |  |  |  |  |
| Is the data key present? |  |  |  |  |
| **CABINET AND CONTROLLER – CABINET TEST WORKSHOP** | | | | |
| For new cabinet and controllers, has the equipment been set up and tested at an enclosed workshop prior to installation in the field? (Standard Specifications 1751-3(C)) |  |  |  |  |
| Does the workshop meet the following requirements? (Standard Specifications 1751-3(C))   1. Located within the Division responsible for project administration 2. Provides protection from the weather 3. Sufficient space to house 2 test observers as well as all necessary test equipment, material, controllers, and cabinets |  |  |  |  |
| Has the equipment been configured, programmed, and tested for proper operation for eight hours minimum, to include the following? (Standard Specifications 1751-3(C))   1. Proper color sequence 2. Flashing operation 3. Phase timings 4. Preemption 5. Coordination 6. Schedule/Time of Day 7. Conflict monitor programming 8. Conflicting phases causes cabinet to revert to flashing operation |  |  |  |  |
| Have all additional tests to ensure proper operation requested by the Engineer been completed? (Standard Specifications 1751-3(C)) |  |  |  |  |
| **CONFLICT MONITOR** | | | | |
| Has the conflict monitor been certified within the past 12 months? (Standard Specifications 1700-3(D))   1. Manufacturer’s certification is acceptable if within the past 12 months 2. Certification testing shall be accomplished using an approved automated conflict monitor tester 3. Certification must be performed every 12 months for the life of the project beginning with the initial test 4. Copies of the certification should be provided to the Engineer and stored in the traffic signal cabinet |  |  |  |  |
| Is the conflict monitor card programmed per the plans? |  |  |  |  |
| Are the conflict monitor switches and jumpers set per the plans? |  |  |  |  |
| Does a laptop communicate to the conflict monitor through the RS-232 or Ethernet port? |  |  |  |  |
| **INDUCTIVE LOOP VEHICLE DETECTION** | | | | |
| Are detection loops located per the plans? |  |  |  |  |
| Are detection loops installed properly? (Standard Specifications 1725-3)   1. Was one week notice given to the Engineer prior to installing the detection loops? 2. Were the detection loops installed in the presence of the Engineer? 3. Were the detection loop locations pre-marked and approved by the Engineer? 4. Were pavement markings, including stop lines and lane lines, pre-marked before locating the detection loops? |  |  |  |  |
| Was the impedance from the loop wire to ground measured for each loop? (Standard Specifications 1725-3)   1. Measurement for each loop should be at least 100 megohms 2. An *‘Inductive Detection Loop & Grounding Test Results’* form should be completed and placed inside the cabinet 3. All detection loops should be included on the *‘Inductive Detection Loop & Grounding Test Results’* form.   The *‘Inductive Detection Loop & Grounding Test Results’* form may be found on the Department’s website:  <https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx> |  |  |  |  |
| Are detection loop tail section wires twisted a minimum of 5 turns per foot? (Standard Specifications 1725-3) |  |  |  |  |
| Is each twisted pair in the junction box labeled with the loop number and polarity on a nylon cable tie? (Standard Specifications 1725-3) |  |  |  |  |
| Was the impedance from the loop system to ground measured at the controller cabinet for each detection loop?   1. Measurement for each loop system should be at least 50 megohms 2. After successful completion of the megger test, each loop system should be tested using an ohmmeter to verify the loop system resistance is less than 0.00885 ohms per foot 3. An *‘Inductive Detection Loop & Grounding Test Results’* form should be completed and placed inside the cabinet 4. All detection loops systems should be included on the *‘Inductive Detection Loop & Grounding Test Results’* form.   The *‘Inductive Detection Loop & Grounding Test Results’* form may be found on the Department’s website:  <https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx> |  |  |  |  |
| Are detector units installed per the plans?   1. Are the sensitivity and frequency settings adjusted properly to avoid missed and false calls? 2. Are they operating properly? 3. Do they place a call on the correct phase? 4. Are they labeled with the correct phase and movement? |  |  |  |  |
| **OTHER VEHICLE DETECTION** | | | | |
| **OTHER VEHICLE DETECTION - VIDEO DETECTION SYSTEM** | | | | |
| Have design drawings showing design details and camera sensor unit locations been provided, reviewed, and accepted prior to installation? |  |  |  |  |
| Are detection zones per plans? |  |  |  |  |
| Are detection zones free from occlusion? |  |  |  |  |
| Detection operating properly? |  |  |  |  |
| **OTHER VEHICLE DETECTION - MICROWAVE DETECTION SYSTEM** | | | | |
| Are detection zones per plans? |  |  |  |  |
| Detection operating properly? |  |  |  |  |
| **OTHER VEHICLE DETECTION - WIRELESS MAGNETIC SENSOR DETECTION SYSTEM** | | | | |
| Are detection zones per plans? |  |  |  |  |
| Detection operating properly? |  |  |  |  |
| **OPERATIONAL CHECKS** | | | | |
| Has the local controller software and version been noted? |  |  |  |  |
| Has controller programming been checked and verified? Does programming match the plans? (Standard Specifications 1700-3(I))   1. General and phase data programming verified 2. Coordination data programming verified 3. Schedule/Time of Day programming verified 4. Preemption programming verified 5. Startup sequence programming verified 6. Phase timing data verified 7. Detector data programming verified |  |  |  |  |
| If the location has any type of preemption, has the *‘Preemption Test Procedure Checklist’* been completed? Have copies of the completed checklist been provided? (Standard Specifications 1751-3(C))  The *Preemption Test Procedure Checklist* may be found on the Department’s website:  <https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx> |  |  |  |  |
| If the location has railroad preemption, ensure the *‘Railroad Preemption Inspection Form’* has been completed prior to turning the signal on for normal operation. Ensure all activities related to railroad preemption are coordinated with the railroad company. Have copies of the completed form been provided? (Standard Specifications 1700-3(G))  The *‘Railroad Preemption Inspection Form’* may be found on the Department’s website:  <https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx> |  |  |  |  |
| Does removal of the conflict monitor cause the cabinet to enter flashing operation? |  |  |  |  |
| Ensure the controller is not programmed for late night flashing operation. (Standard Specifications 1751-3(A))   1. Locations with railroad preemption should never be programmed for late night flashing operation 2. All other locations should not be programmed for late night flashing operation unless otherwise directed |  |  |  |  |
| Do the signal heads flash according to the plans and specifications? (Standard Specifications 1751-3(A))   1. All signal heads flash the correct color (red, yellow, dark) 2. All signal heads for the same approach flash concurrently |  |  |  |  |
| Do all of the detectors place a call to the proper phase as per the plans and specifications?   1. All vehicle detectors place a call to the correct phase 2. All pedestrian detectors place a pedestrian demand on the correct phase |  |  |  |  |
| **SIGNAL HEADS** | | | | |
| **SIGNAL HEADS - GENERAL** | | | | |
| Do all the signal heads have the correct face indication as called for in the plans and specifications? |  |  |  |  |
| Are all the signal heads the correct configuration (3-Section, 4-Section, 5-Section, etc.) as called for in the plans and specifications? |  |  |  |  |
| Are all the signal heads mounted at the proper height? (Standard Specifications 1705-3(B)) |  |  |  |  |
| Are all the signal heads aligned properly with respect to each approach? (Standard Specifications 1705-3(A)) |  |  |  |  |
| Ensure no obstructions, such as utility lines, block the line-of-sight view for each signal head. |  |  |  |  |
| Are new signal heads that are not currently in operation bagged with burlap bags or bags made of non-ripping material? (Standard Specifications 1705-3(A)) |  |  |  |  |
| Is all the required signal head mounting hardware installed and tightened? (Standard Specifications 1705-3(B))   1. Signal heads installed on a messenger cable require: (Standard Drawing 1705.01)    1. Messenger cable hanger    2. Balance adjuster    3. Bottom Cap    4. Wire entrance fitting    5. Insulated bushings 2. Signal heads installed on mast arms require: 3. Rigid signal head mounting brackets 4. Cable attachments and fastening hardware that are fabricated from stainless steel |  |  |  |  |
| **SIGNAL HEADS - BACKPLATES** | | | | |
| Are backplates installed properly on signal heads as required by the plans and specifications? (Standard Specifications 1706-1) (Standard Specifications 1098-3)   1. Installed backplates do not interfere with the function of all door hinges, signal section latches, or mounting hardware 2. Backplates are installed without bends or deformities 3. Backplates are installed with stainless steel fasteners 4. Backplates extend at least 5 inches from the vehicle signal head outline 5. Backplates are provided with a florescent yellow retroreflective strip 2 inches wide, placed along the perimeter of the face of the signal backplate |  |  |  |  |
| **PEDESTRIAN SIGNALS** | | | | |
| **PEDESTRIAN SIGNAL - GENERAL** | | | | |
| Do all the pedestrian signal heads have the correct face indication as called for in the plans and specifications? |  |  |  |  |
| Are all the pedestrian signal heads mounted at the proper height? (Standard Specifications 1705-3(C)) |  |  |  |  |
| Are all the required pedestrian pushbuttons installed and working properly? (Standard Specifications 1705-3(C))   1. Pushbuttons are mounted at the correct height? 2. Pushbuttons place a pedestrian demand on the correct phase? 3. Pushbutton housing assemblies and all metal components are properly bonded to cabinet ground? 4. Are the pushbuttons easily accessible from the walking surface? |  |  |  |  |
| Are signs installed immediately above the pushbutton assemblies? (Standard Specifications 1705-3(C))   1. Countdown pedestrian heads typically require a R10-3E sign installed 2. Non-countdown pedestrian heads typically require a R10-3B sign installed 3. Signs are oriented properly with the arrow pointing the correct direction 4. Staged pedestrian crossings require sign R10-3d |  |  |  |  |
| Do countdown pedestrian signal heads display the correct countdown time during the pedestrian change interval? |  |  |  |  |
| **PEDESTRIAN SIGNAL - ACCESSIBLE PEDESTRIAN SIGNALS** | | | | |
| Are accessible pedestrian signals installed as required per the plans and specifications? |  |  |  |  |
| Do the accessible pedestrian signals operate properly?   1. Locator tone is provided 2. Tactile arrow pushbutton is integrated into the assembly 3. Pushbutton activation is confirmed by a LED pilot light 4. Percussive tones are provided during the Walk interval (most installations) 5. Speech messages are provided during the Walk interval (certain installations, as required by the plans and specifications) 6. Tactile arrow vibrates during the Walk interval |  |  |  |  |
| Is the volume of the accessible pedestrian signal set appropriately?   1. Typically, should be set to 2-5 dB higher than the ambient sound level 2. Maximum of 5 dBA higher than the ambient sound level 3. Should automatically adjust the volume in response to ambient traffic sound level, up to a maximum volume of 100 dBA 4. Should be audible at the beginning of the crosswalk, but no more than 12 feet from the pushbutton |  |  |  |  |
| **PAVEMENT MARKINGS AND SIGNS:** | | | | |
| Are static signs installed properly as called for in the plans and specifications? (Standard Specifications 1745-3)   1. Are signs the correct size? 2. Do the signs have the correct message? 3. Are the signs located properly? 4. Are the signs mounted properly with approved hardware? 5. Are signs mounted on messenger cable installed a minimum of 6 inches from signal heads? 6. Are signs mounted on mast arms adjusted properly? 7. Aimed in the required direction? 8. Plumb as viewed from the respective approach? 9. Tilted forward or backwards as required? |  |  |  |  |
| Are LED blankout signs installed properly as called for in the plans and specifications? (Standard Specifications 1747-3)   1. Are the signs the correct size? 2. Do the signs have the correct message? 3. Are the signs located properly? 4. Are the signs mounted properly with approved hardware? |  |  |  |  |
| Are all pavement markings located properly, the correct size, and installed properly as called for in the plans and specifications? (Standard Specifications 1205-3)   1. Centerline and edgeline markings are correct? 2. Lane-use markings are correct? 3. Stop bar markings are correct? 4. Crosswalks and wheel chair ramps correct? |  |  |  |  |
| **ELECTRICAL SERVICE** | | | | |
| Has an electrical service disconnect external to the signal cabinet and a meter base been installed? (Standard Specifications 1700-3(K)) (Standard Specifications 1098-1(H)) (Standard Drawing 1700.01)   1. Single pole, 50A circuit breaker installed? (Single pole, 30A circuit breaker installed for service to an ATC cabinet?) 2. Located near the signal cabinet and allows for easy access to the service disconnect? 3. Located as not to obstruct sight distance of vehicles turning right on red? 4. Has the maximum available fault current been calculated and listed on an approved label along with the date the calculation was performed per NEC requirements? |  |  |  |  |
| If the electrical service installation is ground mounted, is it installed properly? (Standard Drawing 1700.01)   1. Post mounting installations must:    1. Use 6”x6” pressure treated lumber    2. Wood posts must be installed a minimum of 3 feet into the ground    3. Meter base height shall be between 4 feet and 5 feet (as measured from the center of the meter) 2. Pedestal mounting installations must: 3. Meter base height shall not exceed 5 feet (as measured from the center of the meter) |  |  |  |  |
| For overhead electrical service installations, ensure unfused overhead electrical service conductors are not routed inside of metal poles. (Standard Drawing 1700.01) |  |  |  |  |
| Are all above ground portions of the electrical service conduit to the signal cabinet metallic? (Standard Drawing 1700.01) |  |  |  |  |
| **GROUNDING AND BONDING** | | | | |
| **GROUNDING AND BONDING - GROUNDING SYSTEM AND ELECTRICAL SERVICE** | | | | |
| Is a grounding electrode system provided at the electrical service? (Standard Specifications 1700-3(K)) (Standard Drawing 1700.02)   1. Required at all new electrical services 2. Modify existing grounding electrode system to meet the requirements of the plans, specifications, and NEC 3. Have existing ground rods in the cabinet foundation been removed? Abandoned ground rods shall be cut flush with the cabinet foundation surface |  |  |  |  |
| Has the grounding electrode system been tested for ground resistance? (Standard Specifications 1700-3(K))   1. Maximum acceptable resistance measurement is 20 ohms 2. Additional ground rods may be necessary to meet the requirements 3. Measurements of less than one ohm with a clamp-type meter typically indicate a ground loop and are not acceptable 4. Bonding and grounding circuits must be reworked to remove any ground loops 5. Grounding system must be retested 6. If an acceptable resistance measurement cannot be obtained by using a clamp-type meter, a three-point test method must be used to test the grounding electrode system |  |  |  |  |
| Has the *‘Inductive Detection Loop & Grounding Test Results’* form been completed and submitted? (Standard Specifications 1700-3(K))  The *‘Inductive Detection Loop & Grounding Test Results’* form may be found on the Department’s website:  <https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx> |  |  |  |  |
| Are the grounding conductors connected to the grounding electrode by an irreversible compression ground connector? Connections made with exothermic welds are not acceptable. (Standard Drawing 1700.02) |  |  |  |  |
| Is the neutral bus inside the electrical service disconnect properly bonded to equipment ground? (Standard Drawing 1700.02) |  |  |  |  |
| If the electrical service disconnect and meter base are installed on a wood pole, is the grounding wire between the disconnect and the grounding electrode system properly secured to the pole? (Standard Drawing 1700.02)   1. Ground wire is securely attached to the wood pole? 2. Below 8 feet, staple wire every 12” 3. Above 8 feet, staple wire every 24” 4. Ground wire has been routed and stapled so that the staples can be temporarily removed and grounding wires can be pulled a min of 1.5” off of the pole? |  |  |  |  |
| **GROUNDING AND BONDING - CABINET** | | | | |
| Is the equipment ground bus inside the signal cabinet properly connected to the electrical service disconnect with a #6 AWG min green insulated stranded copper wire? |  |  |  |  |
| Is the neutral bus inside the signal cabinet isolated from the equipment ground bus? |  |  |  |  |
| Are all metal conduits entering the signal cabinet properly bonded together with a #6 AWG solid bare copper wire? (Standard Specifications 1715-3) |  |  |  |  |
| Is there a #6 AWG solid bare copper grounding wire connected between the bonded metal conduits and the equipment ground bus in the signal cabinet? |  |  |  |  |
| **GROUNDING AND BONDING - JUNCTION BOXES** | | | | |
| Are all metal conduits in the junction box properly bonded together with a #6 AWG solid bare copper wire? (Standard Drawing 1716.01) (Standard Specifications 1715-3) |  |  |  |  |
| Are all metallic items enclosing electrical conductors (including the junction box, junction box cover, and conduit) properly bonded together? |  |  |  |  |
| If there is a grounding system located within the junction box, is it properly installed and bonded to all metallic items?   1. Connections to the grounding electrode shall be by an irreversible compression ground connector 2. Grounding system should be bonded to metal conduits and metal parts of the junction box |  |  |  |  |
| **GROUNDING AND BONDING - WOOD POLES** | | | | |
| Is there a grounding system at the base of the pole? (Standard Specifications 1720-3) (Standard Drawing 1720.01)   1. If the pole is located within 10 feet of the electrical service grounding electrode system, that system may be used |  |  |  |  |
| Is the grounding wire installed properly? (Standard Specifications 1720-3) (Standard Drawing 1720.01)   1. A #6 AWG min solid bare copper grounding wire is installed? 2. Ground wire is routed up the pole to a point adjacent to the uppermost span? 3. Ground wire is securely attached to the wood pole? 4. Below 8 feet, staple wire every 12” 5. Above 8 feet, staple wire every 24” |  |  |  |  |
| Is the pole grounding system properly bonded back to the signal cabinet equipment ground? (Standard Specifications 1700-3(L)) (Standard Drawing 1720.01)   1. For poles located near the signal cabinet, a minimum #14 AWG stranded copper conductor with green insulation should be pulled inside the conduit between the pole and signal cabinet 2. For poles not located near the signal cabinet, metal messenger cables may be used as the effective ground-fault current path. Bonding between the pole grounding system and messenger cable must be securely installed |  |  |  |  |
| **GROUNDING AND BONDING - METAL POLES AND PEDESTALS** | | | | |
| Is there a grounding system installed at each metal pole and pedestal foundation? (Standard Drawing 1743.04) (Standard Specifications 1743-3)   1. A type I (Pedestrian pedestal) does not require a grounding system 2. Is the grounding system properly bonded to the metal pole? |  |  |  |  |
| Are all metal conduits entering the metal pole properly bonded together with a #6 AWG solid bare copper wire and bonded to the metal pole? |  |  |  |  |
| Is the metal pole grounding system properly bonded back to the signal cabinet equipment ground? (Standard Specifications 1700-3(L)) (Standard Drawing 1705.02)   1. For poles located near the signal cabinet, a minimum #14 AWG stranded copper conductor with green insulation should be pulled inside the conduit between the metal pole and signal cabinet 2. For poles not located near the signal cabinet, metal messenger cables may be used as the effective ground-fault current path. Bonding between the metal pole and messenger cable must be securely installed |  |  |  |  |
| **GROUNDING AND BONDING - MESSENGER CABLE AND GUY ASSEMBLIES** | | | | |
| Is each messenger cable properly bonded to the pole grounding systems at each end? (Standard Specifications 1710-3) (Standard Drawing 1720.01)   1. Is a #6 AWG min solid bare copper wire used for bonding? 2. Is a parallel groove clamp or 3-bolt clamp used for bonding the messenger wire to the grounding system? |  |  |  |  |
| Is each guy assembly properly bonded to the pole grounding systems? (Standard Specifications 1721-3) (Standard Drawing 1720.01)   1. Is a #6 AWG min solid bare copper wire used for bonding? 2. Is a parallel groove clamp or 3-bolt clamp used for bonding the guy assembly to the grounding system? |  |  |  |  |
| **GROUNDING AND BONDING - CONDUIT AND RISERS** | | | | |
| Are all risers and exposed metallic conduit properly bonded back to the signal cabinet equipment ground? (Standard Specifications 1722-3)   1. Risers and conduit are bonded to the pole grounding systems using approved pipe clamps, split bolt connectors, or parallel groove clamps? 2. Risers are bonded a minimum of 10 feet above grade? |  |  |  |  |
| Are all metal conduits properly bonded together with a #6 AWG min solid bare copper wire? (Standard Specifications 1715-3) |  |  |  |  |
| **GROUNDING AND BONDING - PEDESTRIAN PUSHBUTTON ASSEMBLIES** | | | | |
| Is the pedestrian pushbutton housing and all metal components bonded back to the signal cabinet equipment ground using the lead-in cable ground? (Standard Specifications 1705-3(C)) (Standard Drawing 1705.02) |  |  |  |  |
| **CONDUIT AND RISERS** | | | | |
| Are all conduits installed properly as called for in the plans and specifications? (Standard Specifications 1715-3) |  |  |  |  |
| Are all conduit ends sealed properly? (Standard Specifications 1715-3(A))   1. Spare conduits shall be sealed with approved conduit plugs 2. Spare conduits shall have a pull line secured to the conduit plug in such a manner that it will not interfere with installation of the conduit plug and provides a watertight seal 3. Other conduits shall be sealed with duct and conduit sealer |  |  |  |  |
| Are conduits and risers that contain fiber-optic cable not shared with other types of cables? (Standard Specifications 1730-3(A)) |  |  |  |  |
| Has a green insulated 14 AWG stranded copper wire been installed as a tracer wire for all conduits containing fiber-optic cable? (Standard Specifications 1730-3(A)) (Standard Specifications 1091-3(G)) |  |  |  |  |
| Has a woven polyester pull tape been provided as a pull line in all spare conduits? (Standard Specifications 1091-3(G)) (Standard Specifications 1715-3) |  |  |  |  |
| Has a plan of record drawing been completed and provided for the completed communications conduit system? (Standard Specifications 1730-3(A)) |  |  |  |  |
| Are riser assemblies installed properly as called for in the plans and specifications? (Standard Specifications 1722-3)   1. Properly and securely attached to pole? 2. Has a minimum of 10 inch and maximum of 18 inch offset from the messenger wire to the top of the riser been provided? 3. On utility owned poles, has a 40 inch offset from electrical utility power conductors to the top of the riser been provided? |  |  |  |  |
| Has the proper size riser assembly been provided? (Standard Specifications 1722-3)   1. Separate 1/2-inch riser with weatherhead provided for pedestrian pushbuttons? 2. Separate 1-inch riser with weatherhead provided for electrical service? 3. Separate 2-inch riser with weatherhead provided for signal cables (bundled)? 4. Separate 2-inch riser with weatherhead provided for lead-in cables? Has condulet been installed on all risers for lead-in cable? 5. Separate 2-inch riser with heat shrink tubing provided for fiber-optic communications and coaxial cables? |  |  |  |  |
| **JUNCTION BOXES** | | | | |
| Were junction boxes installed where required? (Standard Specifications 1716-3)   1. Installed as shown on the plans 2. Installed where underground splicing of electrical cable is necessary |  |  |  |  |
| Were junction boxes installed properly? (Standard Specifications 1716-3)   1. Properly sized per plans? 2. Proper logo on the junction box cover (TRAFFIC SIGNAL, NCDOT FIBER OPTIC)? (Standard Drawing 1716.01) 3. Junction box cover secured and in good condition? 4. Installed flush with finish grade? 5. Stone base was added prior to placing the junction box? |  |  |  |  |
| Have coordinates been provided for all junction boxes (and equipment cabinets)? Was a spreadsheet provided that includes (at a minimum) the following information: (Standard Specifications 1716-3)   1. Manufacturer 2. Model number 3. NCDOT inventory number 4. Location 5. Latitude 6. Longitude |  |  |  |  |
| Was the correct size washed stone used (#57 or #67)? (Standard Specifications 1716-2) |  |  |  |  |
| Does the conduit enter the junction box through the bottom? If the conduit enters the junction box through the side, was non-shrinking grout used to seal around the conduit? (Standard Drawing 1716.01) |  |  |  |  |
| Are all conduits inside the junction box sealed properly? (Standard Specifications 1715-3(A))   1. Spare conduits shall be sealed with approved conduit plugs 2. Other conduits shall be sealed with duct and conduit sealer |  |  |  |  |
| **WOOD POLES** | | | | |
| Were final pole locations marked and approval received before poles were installed? (Standard Specifications 1720-3)   1. Poles are to be placed according to signal plans (locations can be adjusted with approval) 2. Locate poles a minimum of 6 feet behind face of curb (unless otherwise specified) 3. Locate poles a minimum of 10 feet from edge of travel way (unless otherwise specified) 4. Ensure poles are within right-of-way 5. Are wires and cables attached to poles at least 10 feet from any high voltage lines? |  |  |  |  |
| Were the correct size and type wood poles used? 40 feet Class 3 poles should be used unless otherwise noted in the plans and specifications. (Standard Specifications 1082-3(F)) |  |  |  |  |
| Were all wood poles installed to be plumb? Ensure each pole is within 2 degrees of vertical when fully loaded. (Standard Specifications 1720-3) |  |  |  |  |
| Is each wood pole tagged, hammer marked, branded, or ink stamped with the approved commercial inspection company’s unique mark? (Standard Specifications 1082-1) |  |  |  |  |
| Is a grounding system installed at each pole? (Standard Specifications 1720-3) (Standard Drawing 1720.01) |  |  |  |  |
| **METAL POLES AND PEDESTALS** | | | | |
| Are all metal poles installed to be plumb? |  |  |  |  |
| Do all metal poles have an identification tag attached? |  |  |  |  |
| Are drilled piers in the correct approved location? |  |  |  |  |
| Are drilled piers and anchor rod assemblies installed according to SP09 R005? |  |  |  |  |
| Are anchor bolt nuts torqued per SP09 R005 and rechecked after 48 hours? |  |  |  |  |
| **MESSENGER CABLE AND GUY ASSEMBLIES** | | | | |
| Is the correct size messenger cable installed? (Standard Specifications 1710-3)   1. 3/8-inch messenger cable shall be used for spans supporting vehicle signal heads and/or signs 2. 1/4-inch messenger cable shall be used for spans supporting only cables unless (otherwise specified in the plans and specifications) |  |  |  |  |
| Is the messenger cable properly installed for each span? (Standard Specifications 1710-3) (Standard Drawing 1720.01)   1. Is a minimum of 27 feet of vertical clearance provided for messenger cable that crosses over railroad tracks? 2. The messenger cable should be tensioned to eliminate appreciable sag and to match the sag of surrounding utilities 3. Allow 3% to 4% sag of the span length between poles |  |  |  |  |
| For permanent installations, is messenger cable installed in continuous lengths with no splices? (Standard Specifications 1710-3)   1. With prior approval, existing messenger cable at temporary installations may be extended with approved hardware instead of installing new messenger cable |  |  |  |  |
| Are guy assemblies properly installed for each span? (Standard Specifications 1721-3) (Standard Drawings 1720.01, 1721.01)   1. Are guys installed using the two-bolt method unless adequate spacing is not available? 2. If adequate spacing is not available, are guys installed using an approved one-bolt method? 3. Are the 5/8-inch shoulder eye bolts installed correctly for a two-bolt installation? 4. Is there 12” – 18” of spacing between the eye bolts? 5. Are there two nuts securely attached to the end of each eye bolt? |  |  |  |  |
| **FIBER-OPTIC CABLE** | | | | |
| Is fiber-optic cable installed properly as called for in the plans and specifications? (Standard Specifications 1730-3(A))   1. Cable is installed in continuous lengths between splicing facilities? 2. Additional 20 feet of cable is provided for termination purposes? 3. Cable ends are sealed with approved heat shrink cable end caps? (Tape is not acceptable) 4. Installed in risers and conduit separate from other types of cable? |  |  |  |  |
| Are communications cable identification markers installed as required? (Standard Specifications 1730-3)   1. Markers are installed within 36 inches of pole attachment points? 2. Markers are installed at locations where more than one cable originates or terminates? 3. Markers are installed on each communication cable entering a junction box? |  |  |  |  |
| Is fiber-optic cable installed properly for all aerial installations? (Standard Specifications 1730-3(B))   1. Fiber-optic cable is double lashed to messenger cable with one 360-degree spiral per foot? 2. An additional 100 feet of each cable is stored? 3. Provided on all cable runs that are continuous without splices as shown on the plans? 4. Approval for storage location has been obtained? 5. Cable is stored on fiber-optic cable storage racks (snow shoes)? 6. Storage is located in the middle of spans between termination points? 7. Storage is not located over the roadway or driveways? |  |  |  |  |
| Is fiber-optic cable installed properly for all underground installations? (Standard Specifications 1730-3(C))   1. Cable is installed in conduit? 2. Approval for cable pulling lubricant and method of pulling was obtained prior to installing the underground cable? |  |  |  |  |
| Are fiber-optic splice centers installed properly as called for in the plans and specifications? (Standard Specifications 1731-3)   1. The cover of each splice tray includes the following: 2. Splice location reference number or identification information 3. Date splice was made 4. Company name 5. Name of individual performing the splicing 6. Are all buffer tubes contained within the splice tray? 7. Are individual buffer tubes secured to the splice tray? 8. Are all fibers, fiber-optic cables, pigtails, and jumpers labeled properly? |  |  |  |  |
| Are all fibers terminated and spliced properly as called for in the plans and specifications? (Standard Specifications 1731-3(B))   1. Are splices secured in the splice block organizer? 2. Has a digital photograph been taken of the splice tray that shows the final workmanship? |  |  |  |  |
| Have existing fiber-optic interconnect centers and splice enclosures been modified as shown on the plans? (Standard Specifications 1731-3(E))   1. Additional patch panels, splice trays, and pigtails installed where necessary? 2. Fiber connections fusion spliced and OTDR testing performed as required by the plans? |  |  |  |  |
| Have bidirectional OTDR tests been performed on each fiber, including spare fibers? (Standard Specifications 1731-3(F))   1. Is the OTDR trace clearly labeled as to identify a starting and ending point for all fibers being tested? 2. Has the fiber-optic cable been tested at both 1310 and 1550 nm? 3. Has one hard copy and one electronic pdf copy of each OTDR trace results been provided? |  |  |  |  |
| **SYSTEM INTERCONNECTION** | | | | |
| Has the controller IP address and conflict monitor IP address been noted? |  |  |  |  |
| Is communications interface equipment and hardware installed to achieve interconnection of signals as required by the plans and specifications? (Standard Specifications 1751-3(B))   1. Is the equipment mounted securely? 2. Are cables labeled and secured? |  |  |  |  |
| Has equipment documentation for communications interface equipment been provided and a copy stored in the storage drawer inside the cabinet? |  |  |  |  |
| Has proper operation of interconnection been demonstrated? (Standard Specifications 1751-3(B))   1. Communication between the controller and other controllers in the same system/channel. 2. Communication between the controller and the central signal control server/division office. |  |  |  |  |
| **EQUIPMENT REMOVAL** | | | | |
| Has all Department owned signal and communication related equipment and material not being reused been removed and returned to the Division? (Standard Specifications 1700-3(F)) |  |  |  |  |
| Has the Contractor removed poles, messenger cable, interconnect cable, communications cable, and supporting hardware not being reused? Has the Contractor assumed ownership of these materials? (Standard Specifications 1700-3(F)) |  |  |  |  |