

# UDOT Construction Inspection Guide

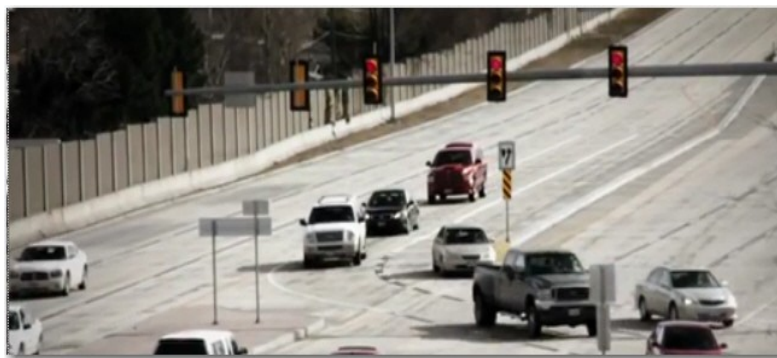
## CHAPTER 7: *Traffic Signals, Lighting, ATMS*



Published 2018







# Table of Contents

## Traffic Signals, Lighting, ATMS

### Contents

<i>UDOT Construction Inspection Guide</i> .....	i
Published 2018 .....	i
7.1 TRAFFIC SIGNALS .....	2
A) Traffic Signals – Section 02892 .....	2
B) Highway Lighting – Section 16525 .....	5
C) Electrical Work Bridges – Section 16526 .....	8
7.2 ATMS (ADVANCED TRAFFIC MANAGEMENT SYSTEM) .....	9
A) ATMS Conduit – Section 13553 .....	9
B) ATMS Cabinet- Section 13555 .....	11
C) Ramp Meter Signals and Signing – Section 13552 .....	13
D) Polymer Concrete Junction Box – Section 13554 .....	15
E) Closed Circuit Television (CCTV) Assembly – Section 13556 .....	17
F) Fiber Optic Communication – Section 13594 .....	19
G) ATMS Integration – Section 13595 .....	21
7.3 MESSAGING AND MONITORING .....	22
A) Variable Message Sign – Section 13557 .....	22
B) Non-Intrusive Detector (NID) System – Section 13559 .....	24
C) Traffic Monitoring Detector Loop – Section 13591 .....	26
D) Roadway Weather Information System – Environmental Sensor Station – Section 13592 .....	27
7.4 ELECTRICAL POWER .....	30
A) Electrical Power – Section 16530 .....	30



# Chapter 7

## 7.1 TRAFFIC SIGNALS

### A) TRAFFIC SIGNALS – SECTION 02892

#### [2017 Standard Specifications](#)

This section includes traffic signals and supports.

#### **General**

Traffic Signal Systems are used to control competing traffic flows by assigning right of way. The operation of the signal system is vital to the prevention of traffic accidents. All components work together to provide a safe and efficient system of controlling vehicles and pedestrians.

The inspector must review the plans and specifications to verify the locations and elevations of traffic signal foundations and poles are correct.

Trenching must be correct for size, depth, number and type of conduits. Verify that PVC



conduit is used underground and galvanized rigid steel conduit above ground and that conduit or wire is installed and backfilled as per specifications.

The inspector, in coordination with the materials technician, ensures that materials acceptance testing is performed according to [MS&TR](#).

The inspector verifies that workmanship meets the plans and specifications.

### ***Contractor Submittals***

1. Certification for Licensed Journeyman or Master Electrician and at least two IMSA Traffic Signal Field Level II certified technicians or Department approved equivalent
2. List of equipment and materials, shop drawing wiring diagrams, and certifications
3. Manufacturer warranties, guarantees, instruction sheets, and parts lists
4. Warranty letter
5. Corrective action plan when required
6. Flowable Fill:
  - a. Batch proportions submitted seven days before placement – for approval
  - b. Certified test results or trial batch to verify strength before placement
7. Free Draining Granular Backfill
  - a. Supplier/Source
  - b. Sieve analysis
8. Concrete mix design for approval
9. Hot and/or Cold Weather Plan
10. Certificate of compliance for reinforcing steel
11. Product data sheet and installation instructions for signs and sign mounts
12. Buy America Certifications and documentation, when applicable

### ***Common Issues***

1. Concrete mix design not approved.
2. Reinforcing steel is not properly placed.
3. Missing documentation.
4. Concrete does not meet air or slump requirements.
5. Not adhering to cold and hot weather concreting plans.

6. Location or elevation of foundation wrong.
7. Trenching or directional boring not at required depth.
8. Signal Heads not pointed in proper direction.
9. UDOT Traffic and Signal Division not included in the Signal Evaluation.

**02892: TRAFFIC SIGNALS****Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Complete Steel Reinforcements Checklist.
- ☐ Complete Concrete Checklist
- ☐ Complete UDOT Traffic Signal Turn-on Checklist before scheduling the in-progress signal inspection.  
<http://www.udot.utah.gov/main/uconowner.gf?n=22158027055950899>
- ☐ In-progress signal inspection with the Region Signal Supervisor at least 7 days before turn-on.
- ☐ Provide written acceptance from the Region Signal Supervisor for checklist items required before turn on not checked "Y".
- ☐ Notify Engineer at least 5 days before signal turn-on.
- ☐ Turn-on is not considered complete until ATMS fiber optic communications are functional according the Section 13594.
- ☐ Engineer pre-approval of all phasing and timing changes.
- ☐ Install railroad preemption for new signals within 500 ft of an at-grade railroad crossing.
- ☐ Review plans and specifications for locations and elevations of poles and foundations, and size and types of poles and foundations.
- ☐ Verify state furnished materials, drilled foundation hole as per plan dimensions
- ☐ Reinforcing steel verified as correct, acceptable anchor bolts properly placed and oriented in correct direction and secured.
- ☐ Trenching as per plan and specification.
- ☐ Conduit or wiring installed and backfilled properly, controller box placed as approved, signal head firmly attached.
- ☐ Pole, mast, and signal head at correct elevation
- ☐ Bolts tightened correctly.
- ☐ Salvaged materials removed properly when applicable
- ☐ Concrete slump and air meet specifications
- ☐ Testing frequency meets [MS&TR](#).
- ☐ Materials documentation for all concrete, reinforcing steel, and HMA materials used



## B) HIGHWAY LIGHTING – SECTION 16525

### 2017 Standard Specifications

This section includes lighting for highway, understructure, sign, bridge, parking lot, and other lighting systems.

#### **General**

Highway lighting is used to improve visibility on roadways. There are a variety of sizes and styles of lighting for use in varying applications. It is important that the appropriate lighting is installed as per plans and specifications to ensure that the lighting provides the desired degree of visibility for people using the facility.

The inspector must review the plans and specifications to verify the locations and elevations of light pole foundations and that the depth, size, and reinforcement are correct. The inspector needs to verify the reinforcing steel is in good condition when placed.

Trenching and boring is to be performed according to Section 02892, Traffic Signals and the light pole installed according to SL Series Standard Drawings. The inspector needs to verify that the correct type and size of pole are used and that the pole is in good condition.

The inspector, in coordination with the materials technician, ensures that materials acceptance testing is performed according to [MS&TR](#).

The inspector verifies that workmanship meets the plans and specifications.

#### **Contractor Submittals**

1. Parts list, wiring schematics, installation instructions, shop drawings, and maintenance manuals for review
2. Warranty and guarantee information, and certifications for review
3. Warranty letter
4. Conduit, conductors and grounding, splice, molded connector and fuse holder, medium voltage conductors and transformer, highway lighting electrical service
5. Product data sheets and recommended installation instructions or APL compliance form
6. Warranties and parts lists
7. Conduit mandrel test form

8. Paint:
  - a. Source and type of solvent if required
  - b. Manufacturer information for specified coating materials
  - c. Test samples
  - d. Disposal certificates for all waste paint
9. Certificate of compliance for mounting hardware
10. Verified HMA mix design Verification hydrated lime supplier is prequalified
11. Verification asphalt binder meets 02745 and vendor adheres to UDOT QMP 509
12. Certificate of compliance for reinforcing steel
13. Concrete mix design for approval
14. Hot and/or Cold Weather Plan
15. Flowable Fill
  - a. Batch proportions submitted seven days before placement
  - b. Certified test results or trial batch to verify strength before placement
16. Buy America Certifications and documentation, when applicable

### ***Common Issues***

1. Concrete mix design not approved.
2. Reinforcing steel is not properly placed.
3. Missing certifications.
4. Concrete does not meet air or slump requirements.
5. Not adhering to cold and hot weather concreting plans.
6. Location or elevation of foundation wrong
7. Improper pole or luminaire.
8. Incorrect foundation bolt pattern for mounting.





## 16525: HIGHWAY LIGHTING

## Inspector's Checklist

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Complete Steel Reinforcements Checklist.
- ☐ Complete Concrete Checklist
- ☐ Review plans and specifications for locations and elevations of poles and foundations.
- ☐ Verify state furnished materials, drilled foundation hole as per plan dimensions
- ☐ Reinforcing steel verified as correct, acceptable anchor bolts properly placed and oriented in correct direction and secured.
- ☐ Pole, mast, and luminaire at correct elevation
- ☐ Bolts tightened correctly (Anchor bolts to 118 lbf-ft, Slip bolts to 80 lbf-ft, release and re-torque to 70 lbf-ft).
- ☐ Salvaged materials removed properly when applicable
- ☐ Concrete slump and air meet specifications
- ☐ Testing frequency meets [MS&TR](#).
- ☐ Materials documentation for all concrete, reinforcing steel, and HMA materials used
- ☐ Highway Lighting Inspection Checklist – Completed - Signed and Dated by UDOT Approved Inspector

## C) ELECTRICAL WORK BRIDGES – SECTION 16526

### [2017 Standard Specifications](#)

#### **General**

Electrical Work on bridges must be installed correctly without interfering with the structure of the bridge. It is important that electrical conduit, junction boxes and other materials conform to requirements and are placed as per plan.

#### **Contractor Submittal**

1. Detailed shop drawings of all fabricated materials for approval
2. Parts list, wiring schematics, installation instructions, shop drawings, and maintenance manuals for review
3. Warranty and guarantee information, and certifications for review
4. Warranty letter
5. Conduit and fittings:
  - a. Product data sheets and recommended installation instructions or APL compliance form
  - b. Warranties and parts lists
  - c. Conduit mandrel test form
6. Buy America Certifications and documentation, when applicable.

#### **16526: ELECTRICAL WORK BRIDGES**

##### **Inspector's Checklist**

- ☐ Submittals on file
- ☐ Detailed shop drawings of all fabricated materials.
- ☐ Complete Daily Progress Report
- ☐ Review plans and specifications for locations and types of electrical materials.
- ☐ Verify that all electrical conduit, junction boxes and other materials are the correct type and in the correct locations as per plans and specifications.

## 7.2 ATMS (ADVANCED TRAFFIC MANAGEMENT SYSTEM)

ATMS is a system of interconnected components used to enhance the use of the facility. Differing locations have differing requirements so the number and types of interconnected components vary.

### A) ATMS CONDUIT – SECTION 1 3553

#### 2017 Standard Specifications

This section includes ATMS conduit for communications and fiber optic cables and detectable pull tape, conduit, and all materials, labor, workmanship, equipment, and incidental items required for a complete system of conduit.

#### **General**

ATMS conduit is used to run a variety of different wires for power and controls of various traffic management devices. The conduit must be the correct size and type and be installed properly to offer adequate space and protection for the wiring and to ensure that the wires can be pulled through the conduit as required.

The inspector must review the plans and specifications to verify the size, types and locations of conduit runs and note the locations of boring and trenching.

Conduit routing is to be determined in the field based on actual conditions at the time of construction to prevent conflicts with existing utilities. The inspector should verify that conduits are not placed directly above existing utilities, conduits crossing roadways are bored, and conduits are run under park strip where curb and gutter are present.

The inspector, in coordination with the materials technician, ensures that materials acceptance testing is performed according to [MS&TR](#).

The inspector verifies that workmanship meets the plans and specifications.



**Contractor Submittals**

1. Product data sheets and recommended installation instructions or APL compliance form
2. Warranties and parts lists
3. Conduit mandrel test form
4. Flowable Fill:
  - a. Batch proportions submitted seven days before placement
  - b. Certified test results or trial batch to verify strength before placement
5. Free draining granular backfill:
  - a. Supplier/Source
  - b. Sieve analysis

**Common Issues**

1. Conduit not placed at required depth.
2. Flowable fill not placed to required height.
3. Difficulty pulling cables because conduits deflect too much

**13553: ATMS CONDUIT****Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Conduits are not directly above existing utilities.
- ☐ Conduits are in park strips when curb and gutters are present.
- ☐ Correct junction box and vault spacing
- ☐ Conduits are not field bent
- ☐ Minimum cover of conduit
- ☐ Correct location and installation
- ☐ Trenching as per plan
- ☐ Conduit or wiring installed and backfilled properly
- ☐ ATMS Conduit Inspection Checklist – Completed – Signed and Dated by UDOT Approved Inspector
- ☐ Conduit Mandrel Test 2015 – Completed – Signed and Dated by UDOT Approved Inspector

## B) ATMS CABINET- SECTION 13555

### 2017 Standard Specifications

This section includes installation of State furnished ATMS cabinets, installation or modification of concrete foundations, and pedestal-mounted and pole-mounted cabinets.

#### **General**

ATMS cabinets house electrical equipment used for traffic monitoring and control. The equipment must be protected from the elements and securely fastened. The cabinets may be mounted to either poles or foundations and provide maintenance access to the equipment for future servicing.

The inspector must review the plans and specifications to verify the locations and types of cabinets and foundations.

The inspector must verify that maintenance platforms are installed around the foundation if the area is not paved.

The inspector, in coordination with the materials technician, ensures that materials acceptance testing is performed according to [MS&TR](#).

The inspector verifies that workmanship meets the plans and specifications.

#### **Contractor Submittals**

1. Concrete mix design for approval
2. Conduit
  - a. Product data sheets and recommended installation instructions or APL compliance form
  - b. Warranties and parts lists
  - c. Conduit mandrel test form
3. Ground rod, power source, transformer and disconnect conductors
  - a. Product data sheets and installation instructions
  - b. Test results
  - c. Warranties and guarantees
4. Product data sheets and recommended installation instructions or APL compliance form for expansion joint material



5. Approved Concrete Mix Design
6. Hot and/or Cold Weather Plan

### **Common Issues**

1. Concrete mix design not approved.
2. Reinforcing steel is not properly placed.
3. Missing documentation.
4. Concrete does not meet air or slump requirements.
5. Not adhering to cold and hot weather concreting plans.
6. Cabinet not anchored to the foundation properly.
7. Cabinet door not able to fully open and close.

### **13555: ATMS CABINET**

#### **Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Complete Concrete Checklist
- ☐ Concrete slump and air meet specifications
- ☐ Testing frequency meets [MS&TR](#).
- ☐ Correct location and installation
- ☐ Verify cabinet foundation construction
- ☐ Maintenance platforms are installed if the cabinets are not installed on a paved surface.
- ☐ Pole mounted cabinets are secured using galvanized bands.
- ☐ Poles are drilled, and nipples installed at each location.
- ☐ Disconnect or underground service are installed 10 to 15 ft. from cabinet.
- ☐ ATMS Cabinet Inspection Checklist – Completed – Signed and Dated by UDOT Approved Inspector



## C) RAMP METER SIGNALS AND SIGNING – SECTION 13552

### 2017 Standard Specifications

This section includes Ramp Meter Signals and Signing including conduit, junction boxes, signing, mounting brackets, conductors, grounding, and foundations; and installation of state furnished items.

#### **General**

Ramp Meter Signals and Signing are used to control the flow of traffic onto highways. It is important that signs and signals are positioned properly and function as intended for traffic safety and improved use of the highway.



The inspector must review the plans and specifications to verify the locations and types of signs, signals, conduit, and control cabinets. The Contractor field locates all conduit and junction boxes to avoid drainage areas and steep slopes.

The inspector verifies that the installation locations do not interfere with any ground or overhead utilities.

The inspector, in coordination with the materials technician, ensures that

materials acceptance testing is performed according to [MS&TR](#).

The inspector verifies that workmanship meets the plans and specifications.

#### **Contractor Submittals**

1. Certification for Licensed Journeyman or Master Electrician and at least two IMSA Traffic Signal Field Level II certified technicians or Department approved equivalent
2. List of equipment and materials, shop drawing wiring diagrams, and certifications
3. Manufacturer warranties, guarantees, instruction sheets, and parts lists
4. Warranty letter
5. Corrective action plan when required

6. Power conductor, ground rod and conduit:
  - a. Product data sheets and installation instructions
  - b. Test results
  - c. Warranties and guarantees
7. Detector circuit:
  - a. Parts list, wiring schematics, installation instructions, shop drawings, and maintenance manuals for review
  - b. Certified test report of detector homerun cable compliance
  - c. Warranty letter
8. Flowable Fill
  - a. Batch proportions submitted seven days before placement – for approval
  - b. Certified test results or trial batch to verify strength before placement
9. Free Draining Granular Backfill
  - a. Supplier/Source
  - b. Sieve analysis
10. Concrete mix design for approval
11. Hot and/or Cold Weather Plan
12. Certificate of compliance for reinforcing steel
13. Buy America documentation for reinforcing steel, when applicable

### ***Common Issues***

1. Location or elevation of signs and signals wrong.
2. Improperly oriented signals for metered traffic.
3. Concrete mix design not approved.
4. Reinforcing steel is not properly placed.
5. Missing documentation.
6. Concrete does not meet air or slump requirements.
7. Not adhering to cold and hot weather concreting plans.

**13552: RAMP METER SIGNALS AND SIGNING****Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Complete Steel Reinforcements Checklist.
- ☐ Complete Concrete Checklist
- ☐ Foundation hole drilled as per plan dimensions,
- ☐ Reinforcing steel is correct, acceptable anchor bolts properly placed and oriented in correct direction and secured.
- ☐ Trenching as per plan
- ☐ Conduit or wiring installed and backfilled properly, controller box placed as approved, signal head firmly attached.
- ☐ Pole, mast, and signal head at correct elevation
- ☐ Bolts tightened correctly.
- ☐ Ramp Meter Inspection Checklist – Completed – Signed and Dated by a UDOT Approved Inspector

**D) POLYMER CONCRETE JUNCTION BOX – SECTION 13554**[2017 Standard Specifications](#)

This section includes polymer concrete junction boxes, ground rods, and maintenance markers. Includes Type I, Type II, and Type III Polymer-Concrete Junction Boxes.

**General**

Polymer Concrete junction boxes are used to house a variety of electrical and control connections. Proper placement and connections of the junction boxes are important for long service life and maintenance.

The inspector must review the plans and specifications to verify the locations, sizes, and types of junction boxes.

The inspector, in coordination with the materials technician, ensures that materials acceptance testing is performed according to [MS&TR](#).

The inspector verifies that workmanship meets the plans and specifications.



**Contractor Submittals**

1. Concrete mix design for approval
2. Flowable Fill
  - a. Batch proportions submitted seven days before placement
  - b. Certified test results or trial batch to verify strength before placement
3. Granular backfill borrow and free draining granular backfill:
4. Supplier/Source
  - a. Sieve analysis
  - b. Soil classification
  - c. Maximum Dry Density and Optimum Moisture
5. Approved concrete mix design
6. Hot and/or Cold Weather Plan

**Common Issues**

1. Concrete mix design not approved.
2. Missing certifications.
3. Concrete does not meet air or slump requirements.
4. Not adhering to cold and hot weather concreting plans.
5. Junction box not placed flush with surrounding material.
6. Expansion strip not placed securely around junction box.
7. Junction boxes not labeled appropriately for the application.

**13554: POLYMER CONCRETE JUNCTION BOX****Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Complete Concrete Checklist
- ☐ Backfill material type, source, soil classification
- ☐ Optimum moisture, depth of lift, compaction, finishing
- ☐ Verify location and installation according to Manufacturer recommendations
- ☐ Restoration of all damaged areas
- ☐ Verify that the appropriate lid lettering is used.
- ☐ Polymer Concrete Junction Box Inspection Checklist – Completed - Signed and Dated by a UDOT Approved Inspector

## E) CLOSED CIRCUIT TELEVISION (CCTV) ASSEMBLY – SECTION 13556

### 2017 Standard Specifications

This section includes complete and operational CCTV system and installation of State furnished non-lowering and camera lowering CCTV poles, positioner, and dome CCTV assemblies.

#### **General**

Closed Circuit Television Assemblies are used to monitor traffic. They are mounted to poles set on foundations to provide visibility of traffic at desired locations.

The inspector must review the plans and specifications to verify the locations and types of Closed Circuit Television mounting including foundations, poles, mounting and lowering assemblies and verify there are no conflicts with underground or overhead utilities.

The inspector, in coordination with the materials technician, ensures that materials acceptance testing is performed according to [MS&TR](#).

The inspector verifies that workmanship meets the plans and specifications.

#### **Contractor Submittals**

1. Conduit
2. Product data sheets and recommended installation instructions or APL compliance form
3. Warranties and parts lists
4. Conduit mandrel test form
5. Concrete mix design for approval
6. Hot and/or Cold Weather Plan
7. ATMS integration, inspection, testing, and acceptance according to Section 13595:
  - a. Testing forms
  - b. Testing pre-notification forms
8. Certificate of compliance for reinforcing steel
9. Buy America documentation for reinforcing steel, when applicable



**Common Issues**

1. Concrete mix design not approved.
2. Missing documentation.
3. Concrete does not meet air or slump requirements.
4. Not adhering to cold and hot weather concreting plans.
5. Foundations placement and mounting bolts at the wrong elevations.
6. Incorrect foundation bolt pattern for mounting.

**13556: CCTV ASSEMBLY****Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Complete Steel Reinforcements Checklist.
- ☐ Complete Concrete Checklist
- ☐ Foundation hole drilled hole as per plan dimensions,
- ☐ Verify location and installation
- ☐ Reinforcing steel verified as correct, acceptable anchor bolts properly placed and oriented in correct direction and secured.
- ☐ Conduit or wiring installed and backfilled properly
- ☐ Bolts tightened correctly.
- ☐ CCTV Inspection Checklist – Completed - Signed and Dated by a UDOT Approved Inspector



## F) FIBER OPTIC COMMUNICATION – SECTION 1 3594

### [2017 Standard Specifications](#)

This section includes installation and testing of fiber optic communication systems.

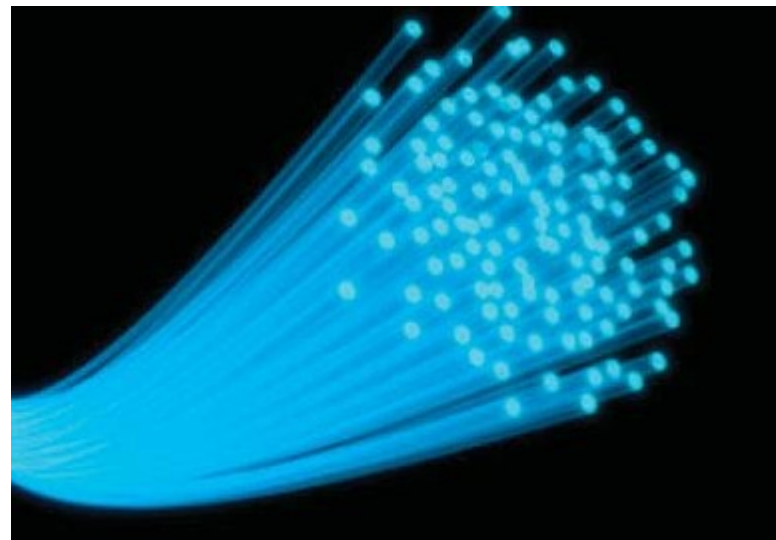
#### **General**

Fiber Optic Communication cables are capable of transferring large amounts of information at one time. The installation and splicing of the cables require skill and attention to ensure that the fiber optic system performs as intended.

The inspector verifies that all fiber optic work is performed by qualified staff and that all splicing is performed in a controlled environment.

#### **Contractor Submittals**

1. Qualified fiber optic technician resume and certificate
2. Pre-construction submittal:
  - a. Factory test results
  - b. Fiber optic reel test
  - c. Fiber optic cable specifications
3. Post-installation submittal:
  - a. Optical time domain reflectometer
  - b. Power meter/light source test results



**Common Issues**

1. Insufficient or incorrect submittals.
2. Unqualified personnel installing equipment.

**13594: FIBER OPTIC COMMUNICATION****Inspection**

- ☐ Fiber Optic Technician Resume and Fiber Optic Training Certificate for all fiber optic staff including installation, splice, and test technicians; before any fiber optic work begins.
  - 2 years of fiber optic work experience
  - Nationally recognized Fiber Optic Training Certificate of Completion.
- ☐ Pre-construction submittal
  - Factor test results showing the attenuation of each cable fiber in dB/km measured at 1310 nm and 1550 nm.
  - Pre-Construction Fiber Optic Cable Reel Test.
- ☐ Post installation submittal
  - Optical Time Domain Reflectometer (OTDR) Test Results
    - Include both electronic PDG and OTDR generated version of each test result.
    - Current OTDR calibration certificate.
    - Electronic submittal on two CDs or USB Flash Drives.
    - Performed prior to the 30 day burn-in test.
  - Power Meter/Light Source Test Results
    - Include electronic PDF version of completed test from with electronic submittal.
    - Performed prior to 30 day burn-in test.
- ☐ Verify that splicing is performed in a controlled environment.
- ☐ Five business day advance notice for testing to be witnessed by Department.
- ☐ Perform work in facilities on conduits, junction boxes, cabinets and buildings containing the Department's existing equipment only in the presence of the Engineer or his authorized representative.
- ☐ Cable slack requirements outlined in 3.1.H

## G) ATMS INTEGRATION – SECTION 13595

## CHAPTER 7

### 2017 Standard Specifications

This section includes integration of all project ATMS devices including successful completion and documentation of all required inspections and operational tests; installing, connecting, and configuring all incidental equipment and components as required for a complete and operational system.



### **General**

ATMS systems must be integrated into a complete system that works to improve and manage traffic flow. It is important that all systems work together as designed and that the system is tested and verified to be a complete and operational system. Testing is performed by UDOT Signal Division or approved Contractor.

### **Common Issues**

1. Insufficient or incorrect submittals.
2. Required testing has not been performed.

### **13595: ATMS INTEGRATION**

#### **Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Inspection and testing performed by appropriate personnel.
- ☐ Completed Conductor Test Form.
- ☐ Completed Engineer Site Inspection Punch List.
- ☐ Completed Local Field Operations Test Form.
- ☐ Completed 30 day ATMS burn-in test form.
- ☐ Completed ATMS Cable and Conductor Test
- ☐ Completed Systems Test.
- ☐ Completed Substantial Completion Inspection.
- ☐ Completed Construction As-Built Drawings.
- ☐ Completed Fiber Optic Test Results.

## 7.3 MESSAGING AND MONITORING

### A) VARIABLE MESSAGE SIGN – SECTION 13557

#### [2017 Standard Specifications](#)

This section includes installation and testing of all State furnished items including VMS sign assembly, VMS access platform, VMS fiber optic communication cable, and VMS controller; and installation of sign connection hardware, communications cable, surge suppressors, and any additional equipment required.

#### **General**

Variable Message Signs are used to notify motorists of conditions and improve traffic flow. The signs are often accessed by a catwalk used for maintenance. It is important that all features of the variable message sign are installed properly to ensure service life and maintenance.

The inspector must review the plans and specifications to verify the type, size and location of variable message signs, structures and foundations.

The inspector verifies that workmanship meets the plans and specifications.

#### **Contractor Submittals**

1. Power source
  - a. Product data sheets and installation instructions
  - b. Test results
  - c. Warranties and guarantees
2. ATMS integration, inspection, testing, and acceptance according to Section 13595:
  - a. Testing forms
  - b. Testing pre-notification forms

#### **Common Issues**

1. Hardware and fasteners not properly installed.
2. Sign elevation does not meet minimum requirements for distance above roadway.

**13557: VARIABLE MESSAGE SIGN****Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Rotational Capacity Test for High Strength bolts (compare with 05120)
- ☐ Reinforcing steel verified as correct, acceptable anchor bolts properly placed and oriented in correct direction and secured.
- ☐ Design height verified.
- ☐ Conduit or wiring installed and backfilled properly, controller box placed as approved, signal head firmly attached.
- ☐ Proper orientation and elevation of signs, structures, and proper sign post lengths.
- ☐ Bolts tightened correctly.
- ☐ Void between base plate and foundation filled with grout.
- ☐ Visual inspection of high tensile strength nuts, bolts, and washers
- ☐ R 256 Inspection/Test Report for materials for fabrication of overhead sign structures and anchor bolts for sign structures from the UDOT Materials Division
- ☐ VMS Inspection Checklist (Type 1) – Completed - Signed and Dated by UDOT Approved Inspector



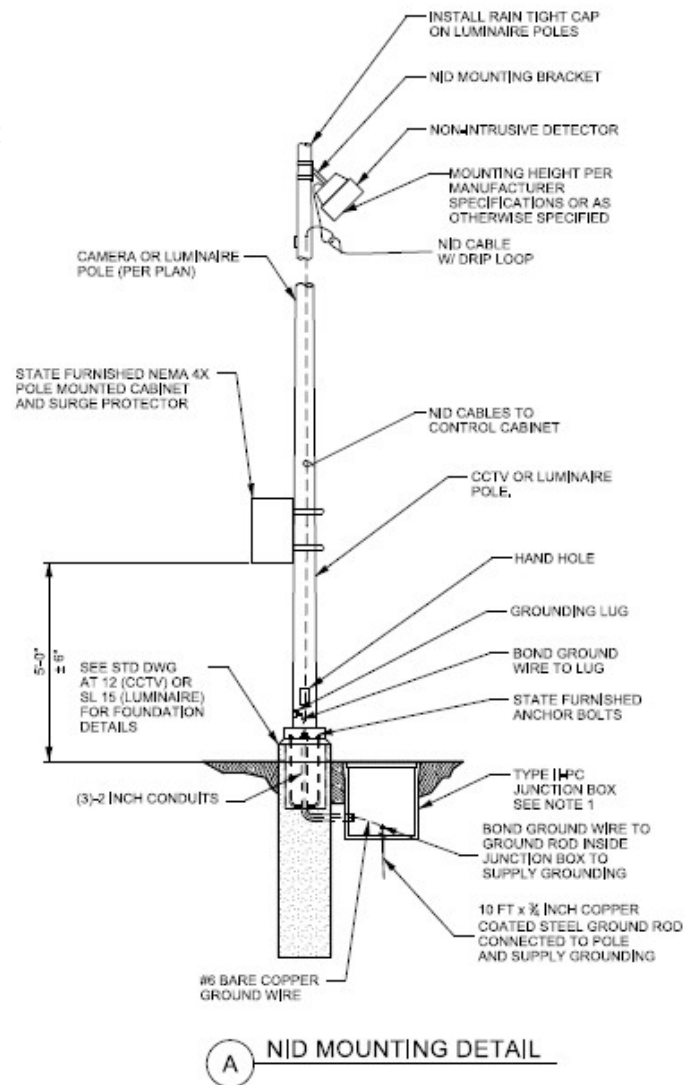
## B) NON-INTRUSIVE DETECTOR (NID) SYSTEM – SECTION 13559

### [2017 Standard Specifications](#)

This section includes materials and procedures for installing State Furnished Non-Intrusive Detector (NID) System.

#### **General**

Non-Intrusive Detection Systems are used to detect traffic. They are pole mounted and require no road cutting or other destructive installation.





The NID system may be mounted to Luminaire poles, CCTV poles or Signal Luminaire extension. The inspector must review the plans and specifications to verify that the NID System and poles are installed correctly.

The inspector verifies that workmanship meets the plans and specifications.

### ***Contractor Submittals***

1. Complete local field operations test form (LFOT) see Section 13595
2. Ground rod:
  - a. Product data sheets and installation instructions
  - b. Test results
  - c. Warranties and guarantees
3. ATMS integration, inspection, testing, and acceptance according to Section 13595:
  - a. Testing forms
  - b. Testing pre-notification forms

### ***Common Issues***

1. Insufficient or incorrect submittals.
2. Required system testing not performed.

#### **13559: NID SYSTEM**

##### **Inspector's Checklist**

- ☐ Verify that the pole is installed as per SL Series Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Verify location and installation
- ☐ Loop wire, lead-in cable and conduit and backfilled properly, connection to junction box as approved.
- ☐ NID Inspection Checklist – Completed - Signed and Dated by a UDOT Approved Inspector

## C) TRAFFIC MONITORING DETECTOR LOOP – SECTION 13591

Section includes detector loop and detector cable.

### **General**

Traffic Monitoring Detector Loops are installed in saw cuts in the roadway and are used to detect traffic for signals. The detector loops must operate as intended for the signal system to function properly.

The inspector verifies that all saw cutting for the Traffic Monitoring Detector Loop are made according to plans and specifications and that saw cutting water and residue is prevented from flowing into live traffic lanes.

The inspector verifies that workmanship meets the plans and specifications.

### **Contractor Submittals**

1. Parts list, wiring schematics, installation instructions, shop drawings, and maintenance manuals for review
2. Certified test report of detector homerun cable compliance
3. Warranty letter ATMS integration, inspection, testing, and acceptance according to Section 13595:
  - a. Testing forms
  - b. Testing pre-notification forms

### **Common Issues**

1. Saw cutting material not cleaned or removed adequately.



### **13591: TRAFFIC MONITORING DETECTOR LOOP**

#### **Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Verify location and installation
- ☐ Loop wire, lead-in cable and conduit and backfilled properly, connection to junction box as approved
- ☐ Detector Loop Inductance and Resistance Test form completed and signed by UDOT Approved inspector.

## D) ROADWAY WEATHER INFORMATION SYSTEM – ENVIRONMENTAL SENSOR STATION – SECTION 13592

RWIS-ESS consists of site preparation, including installing conduit, junction boxes with grounding rods, tower foundation and tower lower section, and concrete pads. Equipment furnished and installed by the Department.

### **General**

The inspector should verify that the location and schedule have been approved by the Engineer.

The inspector, in coordination with the materials technician, ensures that materials acceptance testing is performed according to [MS&TR](#).

The inspector verifies that workmanship meets the plans and specifications.

### **Contractor Submittals**

1. Flowable Fill
2. Batch proportions submitted seven days before placement
3. Certified test results or trial batch to verify strength before placement
4. Ground rod:
  - a. Product data sheets and installation instructions
  - b. Test results
  - c. Warranties and guarantees
5. UTBC:
  - a. Supplier/Source



- b. Aggregate Suitability
  - c. Maximum Dry Density and Optimum Moisture
  - d. Job mix gradation
- 6. Backfill:
  - a. Supplier/Source
  - b. Sieve analysis
  - c. Soil classification
  - d. Maximum Dry Density and Optimum Moisture
- 7. Concrete mix design for approval
- 8. Hot and/or Cold Weather Plan
- 9. Certificate of compliance for reinforcing steel
- 10. Buy America documentation for reinforcing steel, when applicable

### **Common Issues**

- 1. Grounding not connected as per Standard Drawings.
- 2. Concrete mix design not approved.
- 3. Reinforcing steel is not properly placed.
- 4. Missing documentation.
- 5. Concrete does not meet air or slump requirements.
- 6. Not adhering to cold and hot weather concreting plans.

**13592: ROADWAY WEATHER INFORMATION SYSTEM - ENVIRONMENTAL SENSOR****Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Complete Steel Reinforcements Checklist.
- ☐ Complete Concrete Checklist
- ☐ Backfill material type, source, soil classification
- ☐ Optimum moisture, depth of lift, compaction, finishing
- ☐ Verify location and installation according to Manufacturer recommendations
- ☐ Restoration of all damaged areas
- ☐ Verify state furnished materials
- ☐ Verify location and installation
- ☐ Conduit installed and backfilled properly
- ☐ Concrete slump and air meet specifications
- ☐ Testing frequency meets MS&TR.
- ☐ Materials documentation for all concrete, reinforcing steel, and HMA materials used
- ☐ RWIS Inspection Checklist – Completed - Signed and Dated by a UDOT Approved Inspector

## 7.4 ELECTRICAL POWER

### A) ELECTRICAL POWER – SECTION 16530

#### [2017 Standard Specifications](#)

This section includes service pedestals, conduit, conductors, and equipment for electrical services and feeders.

#### **General**

Electrical Power is used to operate Traffic Signals, Highway Lighting and ATMS devices.

There are a variety of electrical power services for use in varying applications. It is important that the appropriate power service is installed as per plans and specifications.

In general, the Utility supplies the power from the “pole” to the transformer and then to the underground (U/G) service pedestal. This is called the “Line” side. UDOT picks up the power from the U/G service pedestal and distributes it to Highway Lighting, ATMS and Traffic Signals. This is called the “Load” side of the pedestal. (See Standard Drawing SL 4C - Underground Service Pedestals)

UDOT supplies the materials from the base of the pole to the U/G service pedestal and the Utility’s contractor installs it. The material includes 3 inch PVC conduit, transformer and U/G service pedestal. (Does UDOT always supply the materials?)

Highway lighting circuits leave the U/G service pedestal and typically go via conduit to a polymer concrete junction box at the base of the lighting pole where the lighting connection is made. High mast lighting circuits may run via conduit within concrete barrier to junction boxes also encased in the barrier.

ATMS circuits leave the U/G service pedestal and go directly to the polymer concrete junction box at the base of the power disconnect frame. (See Standard Drawing AT-9)

The inspector must review the plans and specifications to verify the power disconnect and transformer frame and the U/G service pedestal foundations are the correct size, depth and location. Refer to Standard Drawings SL 4C and AT 9. For the power disconnect frame, the inspector needs to check that the assembly bolts are tight, the power disconnect switch and transformers are securely mounted to the frame, the cut ends of the power disconnect frame have a coat of galvanized paint on them and, all components are in good condition when completed. (Redundant to statement below?)

The inspector verifies that workmanship meets the plans and specifications.



***Contractor Submittals***

1. Manufacturer's product data sheets and installation instructions for the following products:
  - a. Conduit
  - b. Power and grounding conductors
  - c. Disconnect switches
  - d. Panelboards
  - e. Dry type transformers
  - f. Pad mounted oil filled transformers
  - g. Electrical service equipment
  - h. Medium voltage cables
  - i. Medium voltage terminations
2. Test Results - Cables and Conductors
3. Manufacturer's warranties and guarantees before substantial completion.

***Common Issues***

1. Concrete mix design not approved.
2. Missing certifications.
3. Not adhering to cold and hot weather concreting plans.
4. Assembly bolts on ATMS Power Disconnect Frame are not tight, cut ends not re-galvanized.
5. NEMA 3R Disconnect and Transformer not securely mounted to the ATMS Power Disconnect Frame.
6. Conduit connections to NEMA 3R enclosures are not securely mounted or tight.

**Highway Lighting and ATMS Power Service Photos**

Pad Mtd. Oil Filled Transformer



Single Meter Service Pedestal



ATMS Power Disconnect Frame - waiting for grounding rod installation





Disconnect Frame – Foundation Forms

**16530: ELECTRICAL POWER****Inspector's Checklist**

- ☐ Submittals on file
- ☐ Complete Daily Progress Report
- ☐ Review plans and specifications for locations and elevations of foundations.
- ☐ Concrete slump and air meet specifications
- ☐ Testing frequency meets [MS&TR](#).

## Construction Inspection Guide Chapter Links

 <p><b>1-Preface &amp; Introduction</b></p>	 <p><b>2-Traffic Control</b></p>	 <p><b>3-Demolition and Earthwork</b></p>	 <p><b>4-Drainage</b></p>
 <p><b>5-Pavement &amp; Materials</b></p>	 <p><b>6-Structures</b></p>	 <p><b>7-Traffic Signals, Lighting, ATMS</b></p>	 <p><b>8-Striping, Signing, Safety Features</b></p>
 <p><b>9-Landscaping, Fencing, Incidental Const.</b></p>	 <p><b>10-Utilities</b></p>	 <p><b>11-PDBS</b></p>	 <p><b>12-Crash Cushion &amp; Barrier End Treatments</b></p>



# **Construction Inspection Guide**

**[udot.utah.gov/go/construction](http://udot.utah.gov/go/construction)**