Design Manual

Intelligent Transportation Systems (ITS) Section

Part 3

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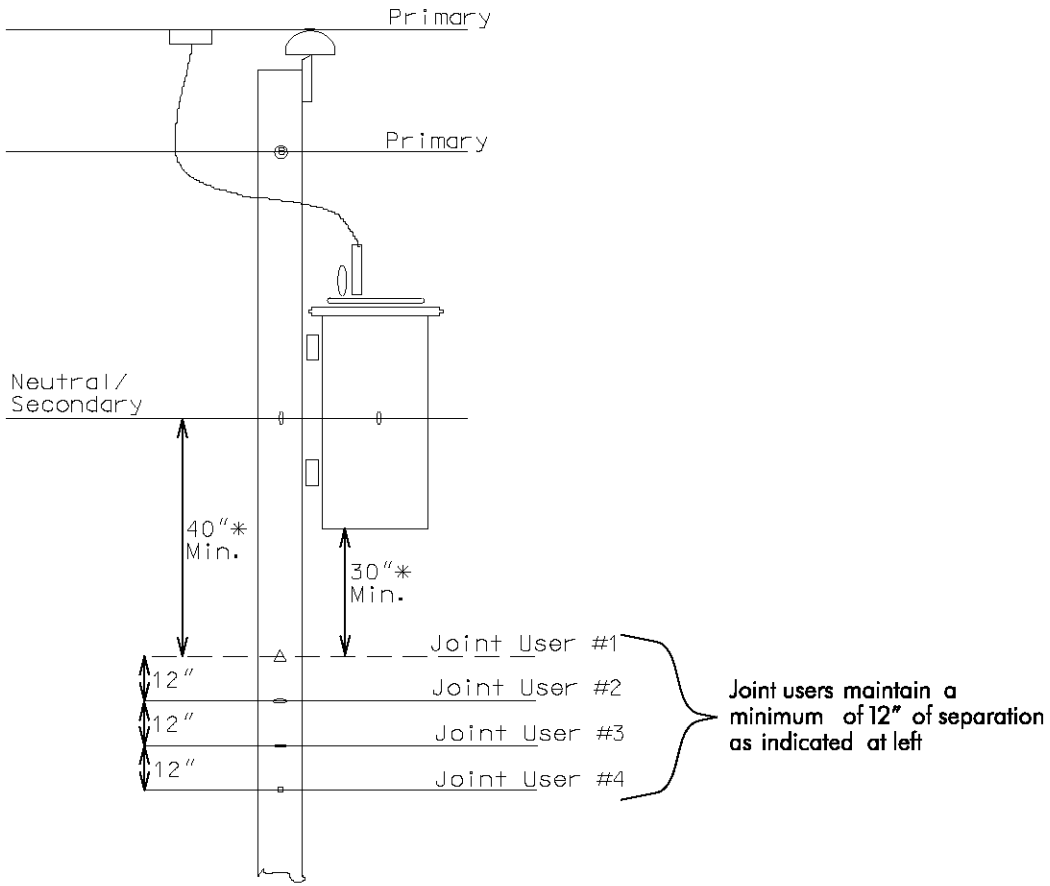
INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

STD. NO.

Minimum Utility Clearance Requirements



NCDOT Minimum Attachment Clearances From Other Joint Users at the Pole

Clearance From	Min. Distance
Neutral / Secondary	40"
Power Service Drop	40"
Power Service Drip Loop[1]	40"
Top of Power Riser	40"
Bottom of Transformer	30"
Guy Attachment	12"

If the power service drip loop supplies power to an effectively grounded streetlight the minimum clearance requirement is reduced to 12"

Notes

The attachment point for joint user #1 must maintain a minimum of 40" below power and/or a minimum of 30" below bottom of transformer (whichever is greater)

"Joint User" refers to the power company CATV companies, NCDOT, phone company, cities, and others

NESC Clearance Requirements – Utilities

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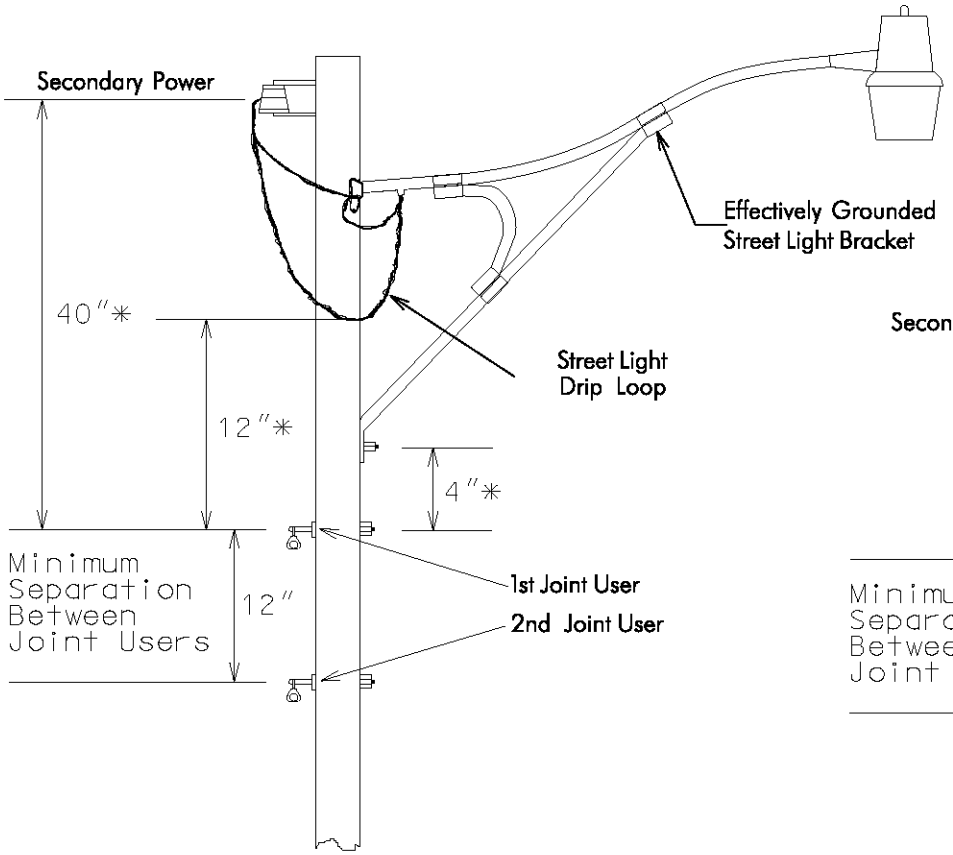
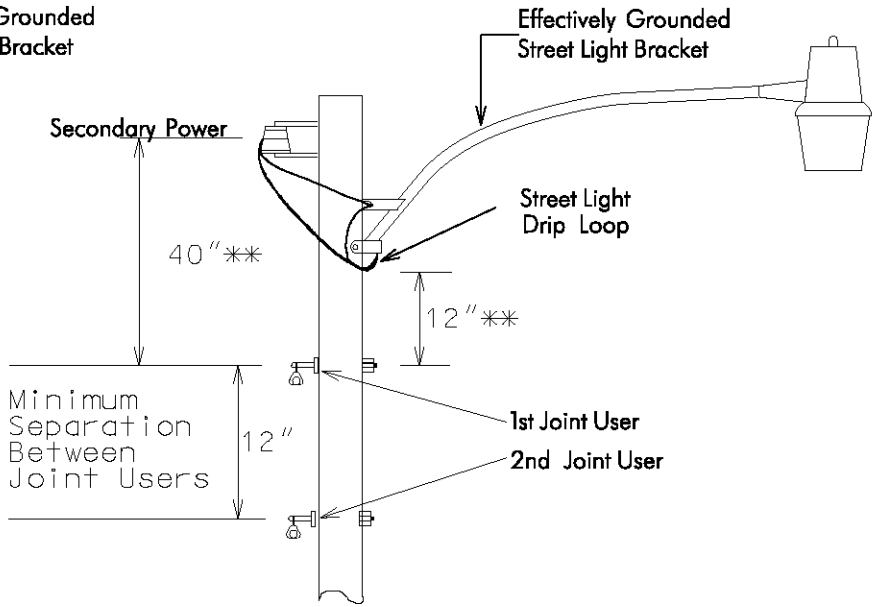
Street Light Clearances



* All three of these minimum clearance requirements for effectively grounded street lights must be met

"Joint User" refers to the power company CATV companies, NCDOT, phone company, cities, and others



**Both of these minimum clearance requirements for effectively grounded street lights must be met

IF THE STREET LIGHT /STREET LIGHT BRACKET IS NOT EFFECTIVELY GROUNDED, THEN THE MINIMUM CLEARANCE REQUIREMENT IS INCREASED TO 40" BELOW DRIP LOOP

NESC Clearance Requirements – Streetlights

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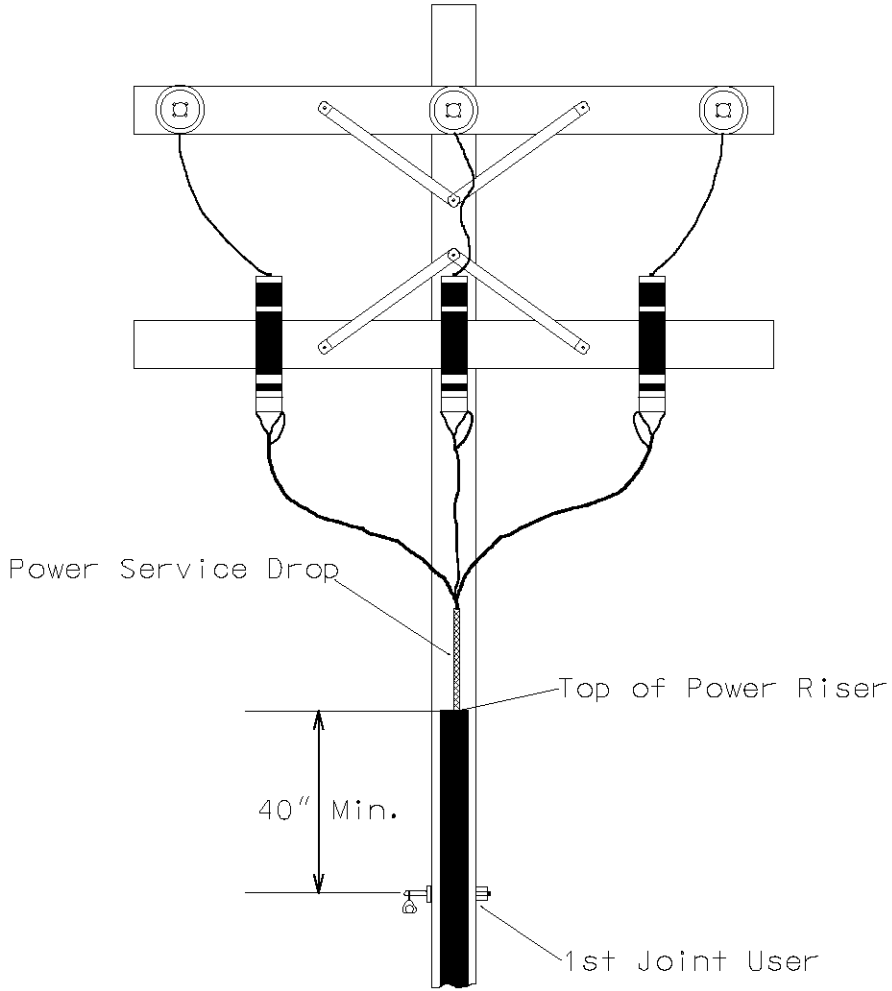

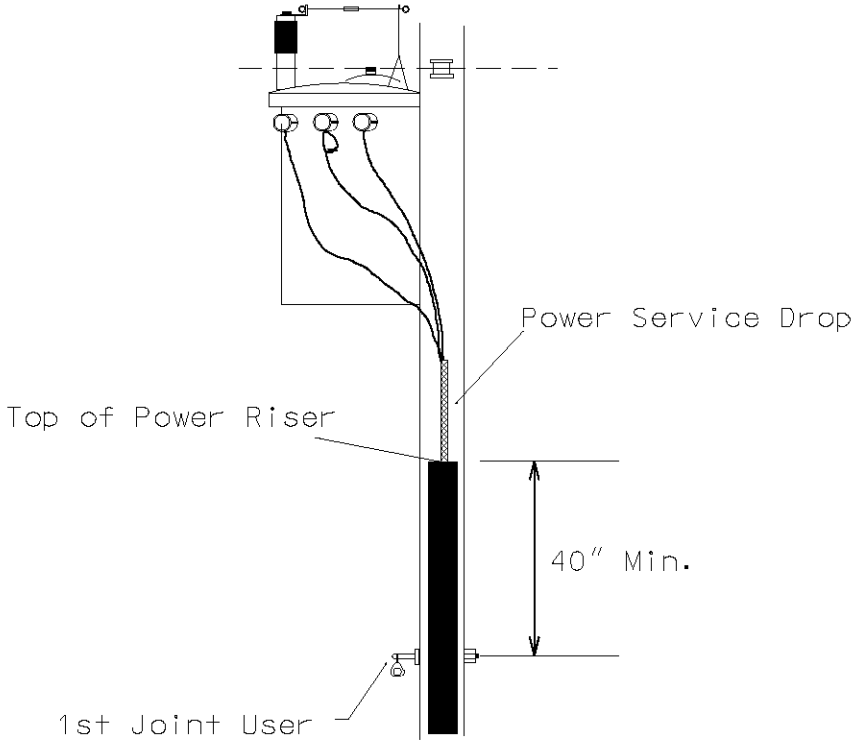

"Joint User" refers to the power company CATV companies, NCDOT, phone company, cities, and others

NESC Clearance Requirements – Power Risers

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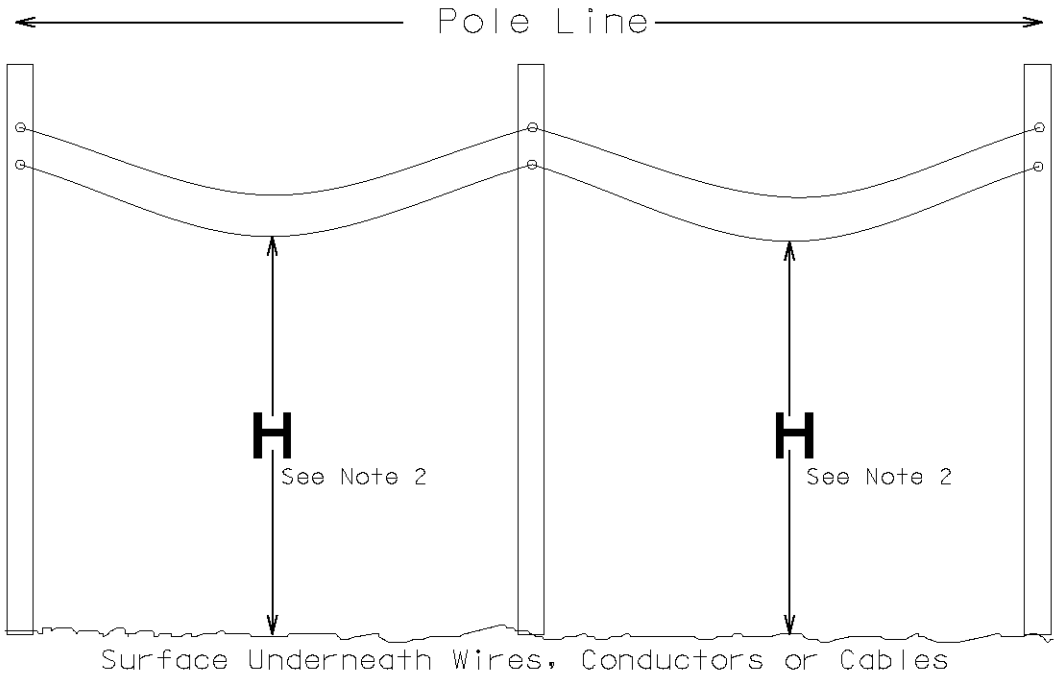

Table 1

Nature of Surface Underneath Wires Conductors or Cables	Minimum Clearance (H)*
1. Track rails of railroad except electrified railroads using overhead trolley conductors	30 FT
2. Roads, streets and other areas subject to truck traffic	18 FT
3. Driveways, parking lots, and alleys	18 FT
4. Other land traversed by vehicles such as cultivated, grazing, forest orchards, etc.	18 FT
5. Spaces and travel ways subject to pedestrian or restricted traffic only	15.5 FT

* These values have been adopted by NCDOT (as well as various utility companies) and exceed the specifications as set forth in the National Electrical Safety Code (NESC).

Notes:

1. See table 1 for acceptable minimum clearance values (H) over varying surfaces
2. "H" is defined as the vertical distance (Height) as measured from the lowest point (Typically Midspan) of the wires, conductors or cables to the surface below
3. Sag between poles should match the sag of existing utility lines

NESC Clearance Requirements – Height Over Grade

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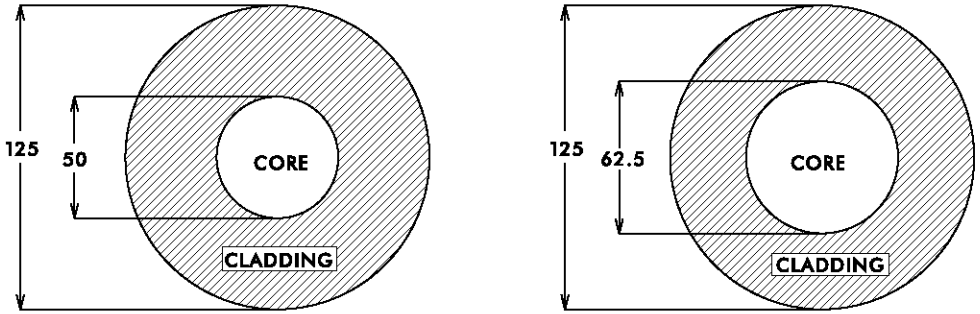
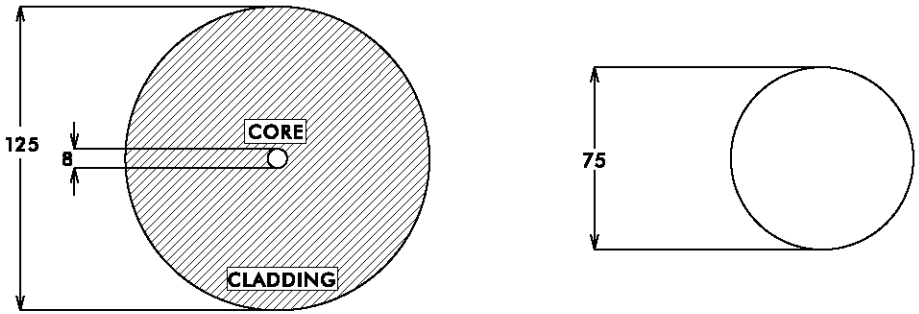
Fiber Optic Cross Section

All dimensions in micrometers (microns)

1,000,000 Microns = 1 Meter



Typical Dimension of Multimode Fiber



Typical Dimensions of Single Mode Fiber

Typical Dimension of Human Hair

Typical Signal Wavelengths

Fiber Type	Signal Wavelength	Typical Losses
Multimode	850 nm	3.5 dB /km
	1300 nm	1.5 dB /km
Single Mode	1310 nm	0.35 dB /km
	1550 nm	0.25 dB /km

Fiber Color Code

Number	Color
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White
7	Red
8	Black
9	Yellow
10	Violet
11	Rose
12	Aqua

	Number	Color
Blue Buffer Tube	1	Blue
	2	Orange
	3	Green
	4	Brown
	5	Slate
	6	White
Orange Buffer Tube	1	Blue
	2	Orange
	3	Green
	4	Brown
	5	Slate
	6	White

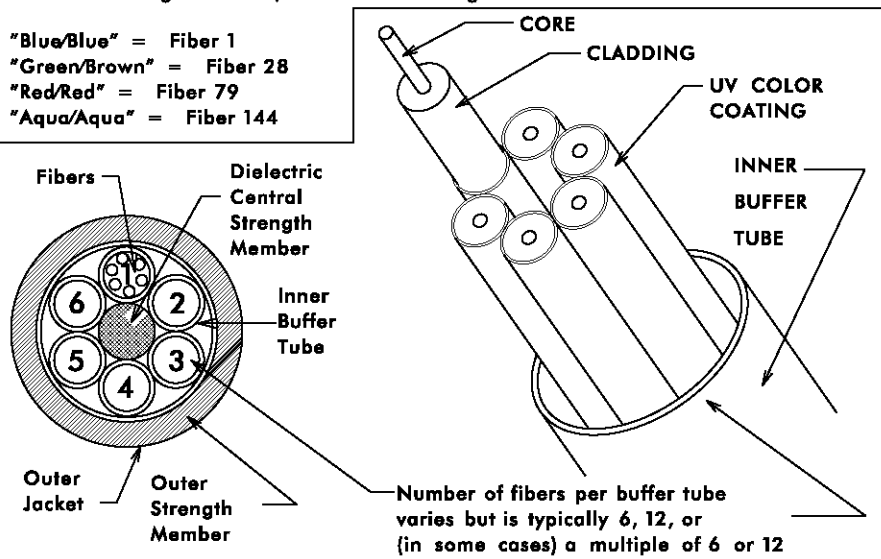
Individual fibers can be identified by number and by color

When specifying by color it is customary to refer to the buffer tube color followed by the fiber color

"Orange/Green" is the green fiber in the orange buffer tube

If a cable contained 144 fibers arranged with 12 buffer tubes each containing 12 fibers, then the following would be true

"Blue/Blue" = Fiber 1
"Green/Brown" = Fiber 28
"Red/Red" = Fiber 79
"Aqua/Aqua" = Fiber 144



FIBER OPTIC CABLE

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COMMON DRAWING SYMBOLS

●	EXISTING SIGNAL POLE	—→	NEW DOWN GUY
○	NEW SIGNAL POLE	↵	NEW SIDEWALK GUY
◘	EXISTING METAL POLE	⊏(((	NEW MICROWAVE VEHICLE DETECTION
⊙	NEW METAL POLE	■(((	EXISTING MICROWAVE VEHICLE DETECTION
◘—	EXISTING METAL POLE WITH MAST ARM	DMS	NEW DYNAMIC MESSAGE SIGN
⊙—	NEW METAL POLE WITH MAST ARM	DMS	EXISTING DYNAMIC MESSAGE SIGN
SP	SIGNAL POLE	—FO—	NEW FIBER OPTIC COMMUNICATIONS CABLE
□	NEW JUNCTION BOX	▪TWIST PR▪	NEW TWISTED PAIR COMMUNICATIONS CABLE
■	EXISTING JUNCTION BOX	—EXI—	EXISTING COMMUNICATIONS CABLE
▷□	NEW CCTV CAMERA	—REM—	EXISTING COMMUNICATIONS CABLE TO BE REMOVED
▶■	EXISTING CCTV CAMERA		NEW AERIAL GUY ASSEMBLY
∞	CABLE STORAGE RACK (SNOW SHOES)		NEW CONDUIT
			EXISTING CONDUIT
S	NEW SPLICE CABINET	—DD—	NEW DIRECTIONAL DRILLED CONDUIT
S	EXISTING SPLICE CABINET	—B&J—	NEW BORED AND JACKED CONDUIT
∞S	AERIAL SPLICE ENCLOSURE	⫴ ⫴	YAGI ANTENNA (DOUBLE) FOR REPEATER OPERATION
⤢	EXISTING SIGNAL CABINET	⫴	YAGI ANTENNA (SINGLE)
M	MASTER CONTROLLER CABINET	((•))	OMNI ATENNA
		XX-XXXX	SIGNAL INVENTORY NUMBER

NOTE:
DRAWING SYMBOLS SHOULD BE AT THE SAME SCALE AS THE PLAN SHEET
FOR INFORMATION ON SCALING LINE STYLES SEE "STANDARD SYMBOLOGY TABLES" SECTION 9.0

Drawing Format Items – Symbology

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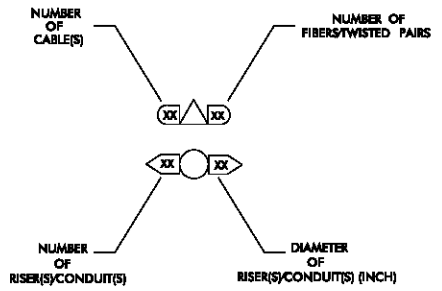
1. INSTALL REA, PE – 22, SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
2. INSTALL REA, PE – 38, (FIGURE 8) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
3. INSTALL REA, PE – 39, (UNDERGROUND) SHIELDED, TWISTED PAIR COMMUNICATIONS CABLE
4. INSTALL SMFO CABLE
5. INSTALL MMFO CABLE
6. INSTALL FIBER OPTIC DROP CABLE
7. INSTALL TRACER WIRE
8. TRENCH OR PLOW
9. INSTALL PVC CONDUIT
10. INSTALL RIGID, GALVANIZED STEEL CONDUIT
11. INSTALL RIGID, GALVANIZED STEEL RISER WITH WEATHERHEAD
12. INSTALL RIGID, GALVANIZED STEEL RISER WITH HEAT SHRINK TUBING
13. INSTALL OUTER-DUCT POLYETHYLENE CONDUIT
14. INSTALL POLYETHYLENE CONDUIT
15. DIRECTIONAL DRILL CONDUIT
16. BORE AND JACK CONDUIT
17. INSTALL CABLE(S) IN EXISTING CONDUIT
18. INSTALL CABLE(S) IN NEW CONDUIT
19. INSTALL CABLE(S) IN EXISTING RISER
20. INSTALL CABLE(S) IN NEW RISER
21. INSTALL CABLE(S) IN EXISTING CONDUIT STUB-OUTS
22. INSTALL NEW CONDUIT INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
23. INSTALL NEW RISER INTO EXISTING CABINET BASE (USE EXISTING CONDUIT STUB-OUTS WHEN AVAILABLE)
24. INSTALL NEW CONDUIT INTO EXISTING POLE MOUNTED CABINET
25. INSTALL NEW RISER INTO EXISTING POLE MOUNTED CABINET
26. TERMINATE COMMUNICATIONS CABLE ON EXISTING TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
27. INSTALL NEW TELEMETRY INTERFACE PANEL IN TRAFFIC SIGNAL CONTROLLER CABINET
28. INSTALL INTERCONNECT CENTER, PATCH PANEL, JUMPERS AND FUSION SPLICE CABLE IN CABINET
29. INSTALL UNDERGROUND SPLICE ENCLOSURE
30. INSTALL AERIAL SPLICE ENCLOSURE
31. INSTALL POLE MOUNTED SPLICE CABINET
32. INSTALL BASE MOUNTED SPLICE CABINET
33. REMOVE EXISTING SPLICE CABINET
34. INSTALL CABINET FOUNDATION
35. REMOVE EXISTING CABINET FOUNDATION
36. INSTALL CCTV CAMERA ASSEMBLY
37. INSTALL CCTV CAMERA WOOD POLE
38. INSTALL CCTV CAMERA METAL POLE AND FOUNDATION
39. INSTALL JUNCTION BOX
40. INSTALL OVERSIZED JUNCTION BOX
41. REMOVE EXISTING JUNCTION BOX
42. INSTALL WOOD POLE
43. REMOVE EXISTING WOOD POLE
44. INSTALL AERIAL GUY ASSEMBLY
45. INSTALL STANDARD GUY ASSEMBLY
46. INSTALL SIDEWALK GUY ASSEMBLY
47. INSTALL MESSENGER CABLE
48. REMOVE EXISTING COMMUNICATIONS AND MESSENGER CABLE
49. REMOVE EXISTING MESSENGER CABLE
50. INSTALL TELEPHONE SERVICE
51. INSTALL CABLE STORAGE RACKS (SNOW SHOES) AND STORE 100 FEET OF CABLE
52. INSTALL DELINEATOR MARKER
53. STORE 20 FEET OF COMMUNICATIONS CABLE
54. LASH CABLE(S) TO EXISTING SIGNAL/COMMUNICATIONS CABLE
55. LASH CABLE(S) TO EXISTING MESSENGER CABLE
56. LASH CABLE(S) TO NEW MESSENGER CABLE
57. MODIFY EXISTING ELECTRICAL SERVICE
58. INSTALL NEW ELECTRICAL SERVICE

LEGEND

- FO — NEW FIBER OPTIC COMMUNICATIONS CABLE
- TWIST PR — NEW TWISTED PAIR COMMUNICATIONS CABLE
- EXI — EXISTING COMMUNICATIONS CABLE
- REM — EXISTING COMMUNICATIONS CABLE TO BE REMOVED
- NEW AERIAL GUY ASSEMBLY
- NEW CONDUIT
- EXISTING CONDUIT
- DD — NEW DIRECTIONAL DRILLED CONDUIT
- BAJ — NEW BORED AND JACKED CONDUIT
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- NEW WOOD POLE
- EXISTING WOOD POLE
- 8 — AERIAL SPLICE ENCLOSURE
- NEW METAL POLE
- EXISTING METAL POLE
- NEW CCTV ASSEMBLY
- EXISTING CCTV ASSEMBLY
- DMS — NEW DYNAMIC MESSAGE SIGN
- DMS — EXISTING DYNAMIC MESSAGE SIGN
- NEW MICROWAVE VEHICLE DETECTION
- EXISTING MICROWAVE VEHICLE DETECTION
- NEW STANDARD GUY ASSEMBLY
- NEW SIDEWALK GUY ASSEMBLY
- NEW CABLE STORAGE RACKS (SNOW SHOES)
- EXISTING CONTROLLER AND CABINET
- S — EXISTING SPLICE CABINET
- S — NEW SPLICE CABINET
- SP — SIGNAL POLE
- XX-XXXX — SIGNAL INVENTORY NUMBER
- CCTV-XX — CCTV IDENTIFICATION NUMBER

CONSTRUCTION NOTE SYMBOLOGY KEY

- (XX) INDICATES NUMBER OF CABLES, LOOPS, ETC.
- (XX) INDICATES NUMBER OF FIBERS PER CABLE, TWISTED PAIRS PER CABLE, ETC.
- <XX> INDICATES NUMBER OF RISER(S)/CONDUIT(S)
- <XX> INDICATES DIAMETER OF RISER(S)/CONDUIT(S) (INCH)



Drawing Format Items – Construction Notes

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Understanding Construction Notes

Install one 12–fiber single mode fiber optic cable

Install two 6–fiber multi–mode fiber optic cables

Install one 2" diameter polyethylene conduit

Install one 1" diameter rigid, galvanized steel riser with weatherhead

Construction Note Conventions

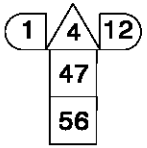
Place notes in numerical order

correct

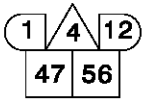
incorrect

Orient vertically

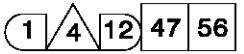
correct



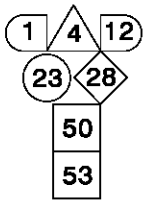
correct



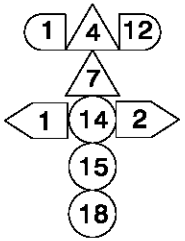
incorrect



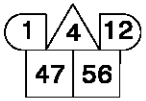
Some Common Construction Notes



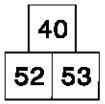
base mounted cabinet (master location)



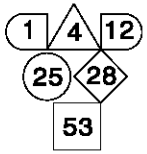
directional drilled conduit



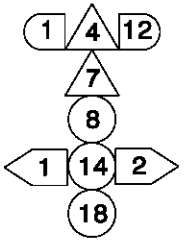
new fiber optic and messenger cable



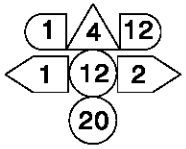
new oversized junction box



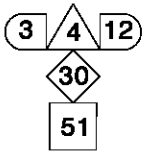
pole mounted cabinet



trenched or plowed conduit



new riser



aerial splice enclosure

For more information on construction notes, see sections 4–7 of this manual

Drawing Format Items – Construction Notes

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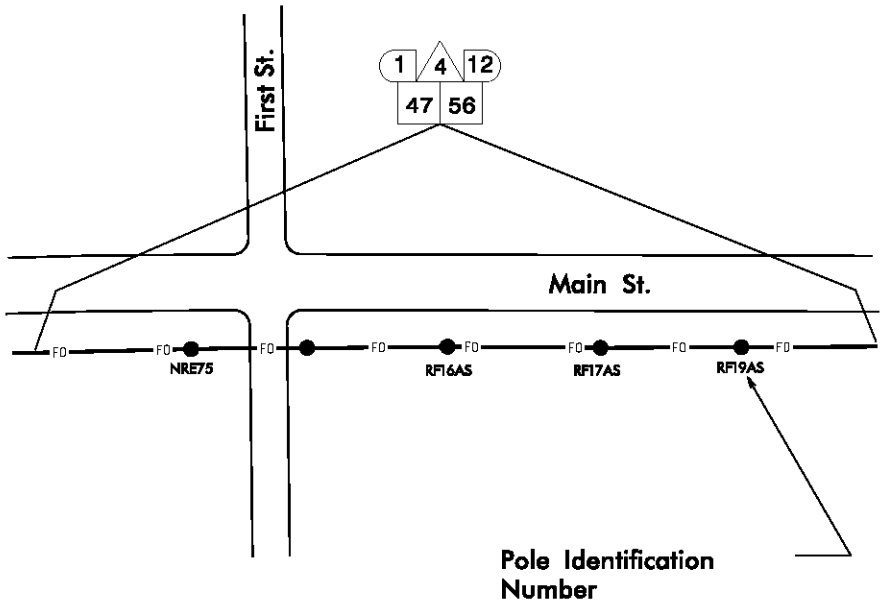
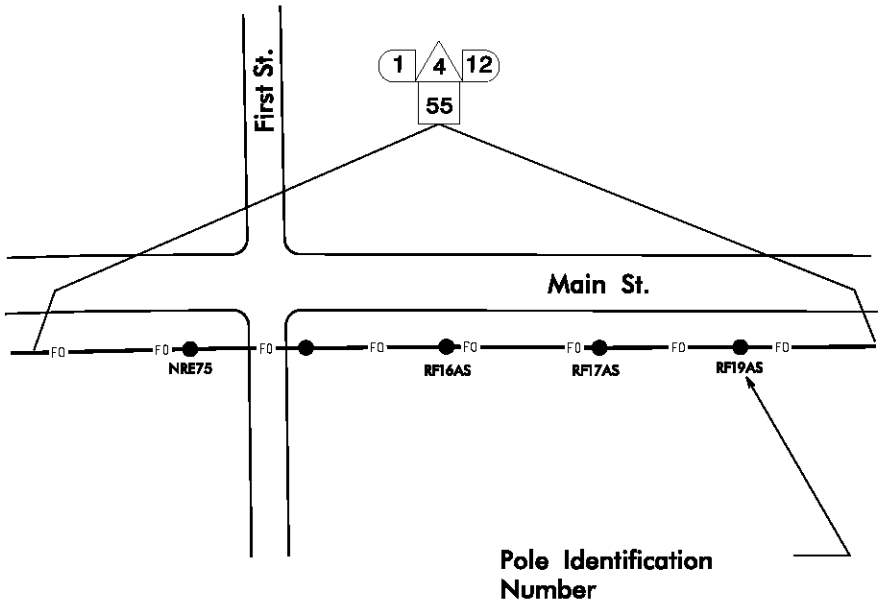
Case 1

New communications cable lashed to new messenger cable



Case 2

New communications cable lashed to existing messenger cable



Construction Notes for Aerial Cable Run

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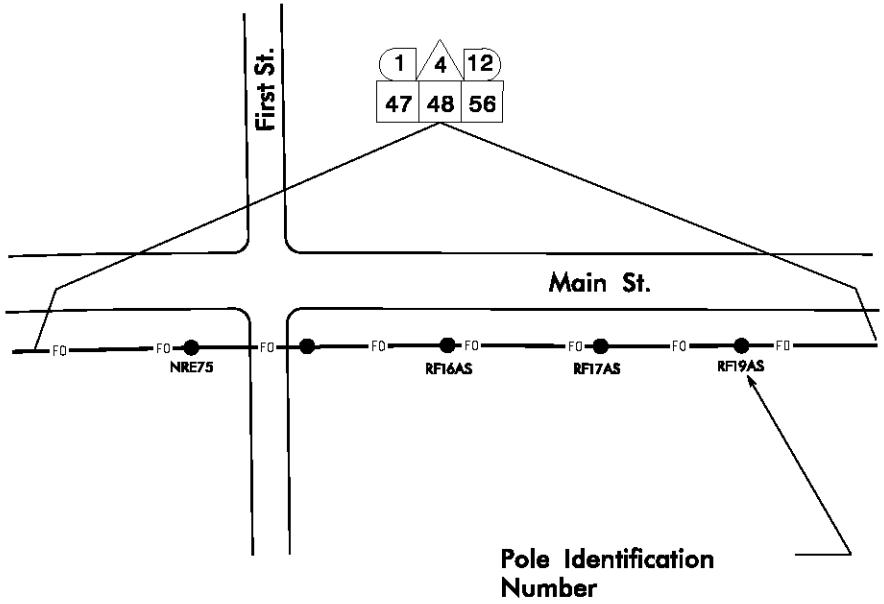
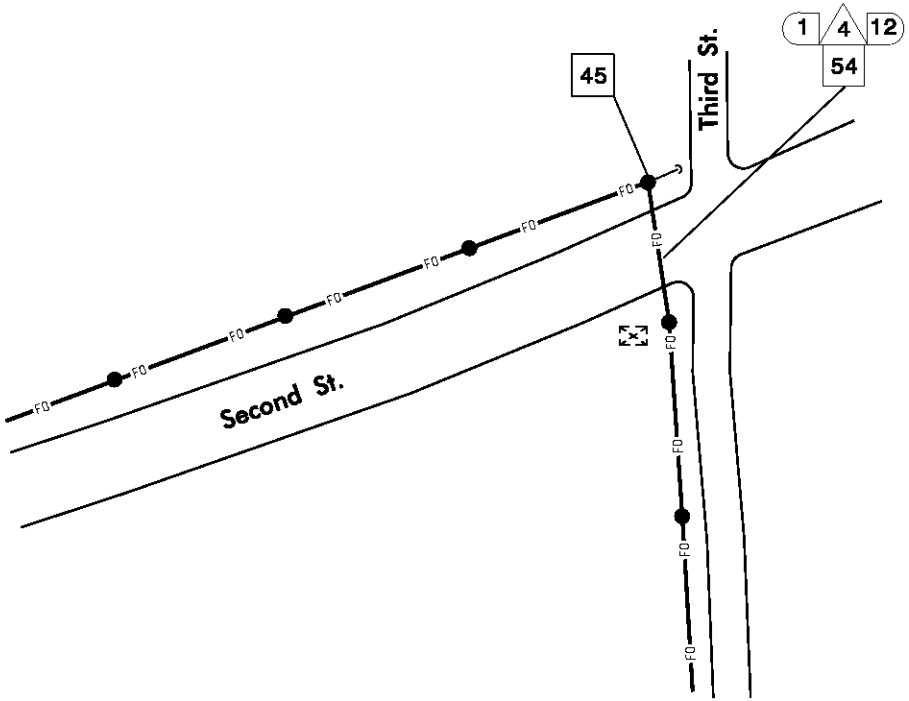
Case 3

Existing communications cable and messenger cable are to be removed new communications cable lashed to new messenger cable



Case 4

New communications cable lashed to existing signal/communications cable



Construction Notes for Aerial Cable Run

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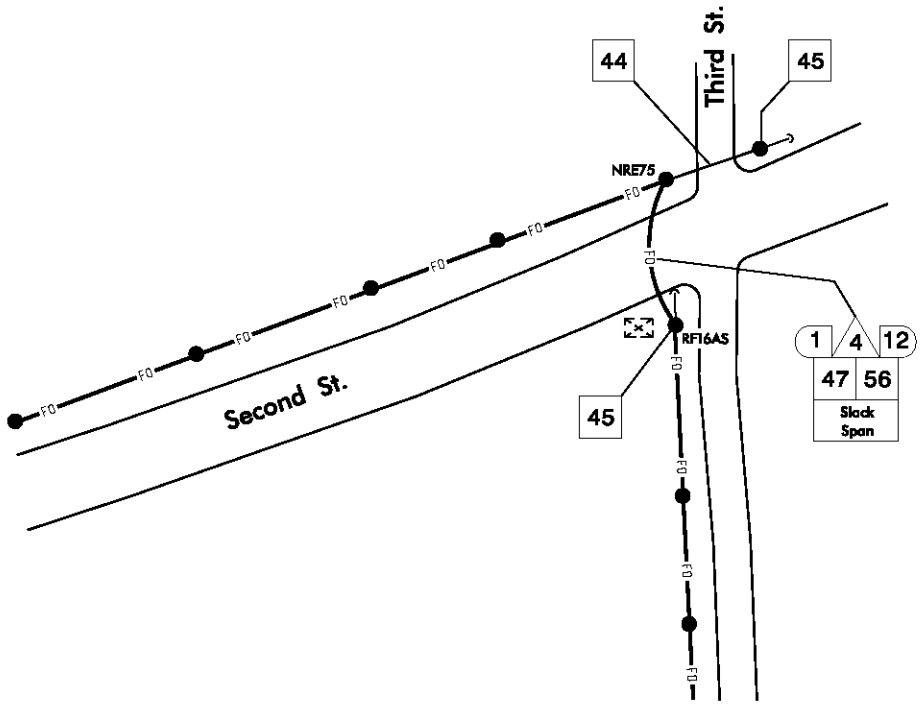
Case 5

New communications cable lashed to
new messenger cable and slack spanned



NOTE: Slack spanning should be used as a last resort.
In this case, a guy could not be placed on pole NRE75 to counteract the tension of the aerial installation along Third Street.
Therefore, slack span to pole RF16AS and place down guy at that pole.

Reserved for future use

Construction Notes for Aerial Cable Run

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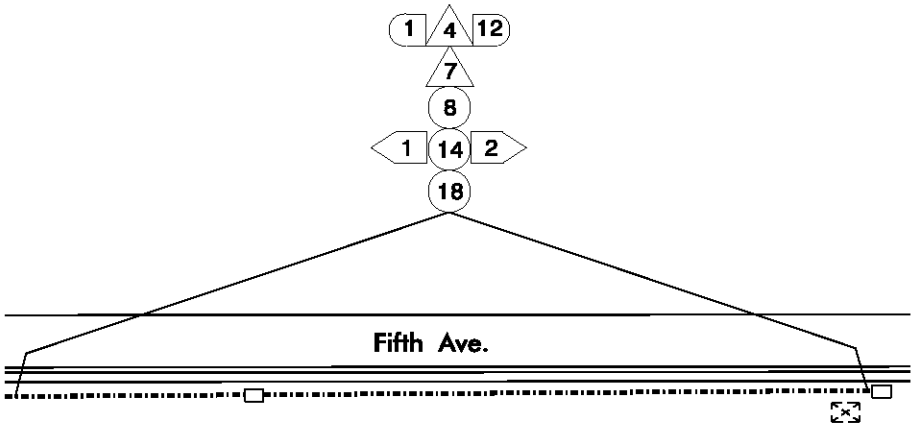
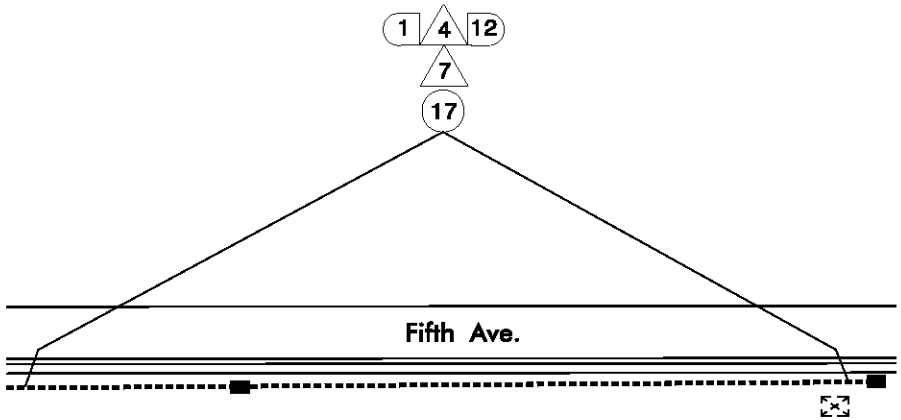
Case 1

Underground communications cable run
installed in new conduit trenched or plowed



Case 2

Underground communications cable run
installed in existing conduit



Construction Notes for Trenched or Plowed Conduit

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

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4.1
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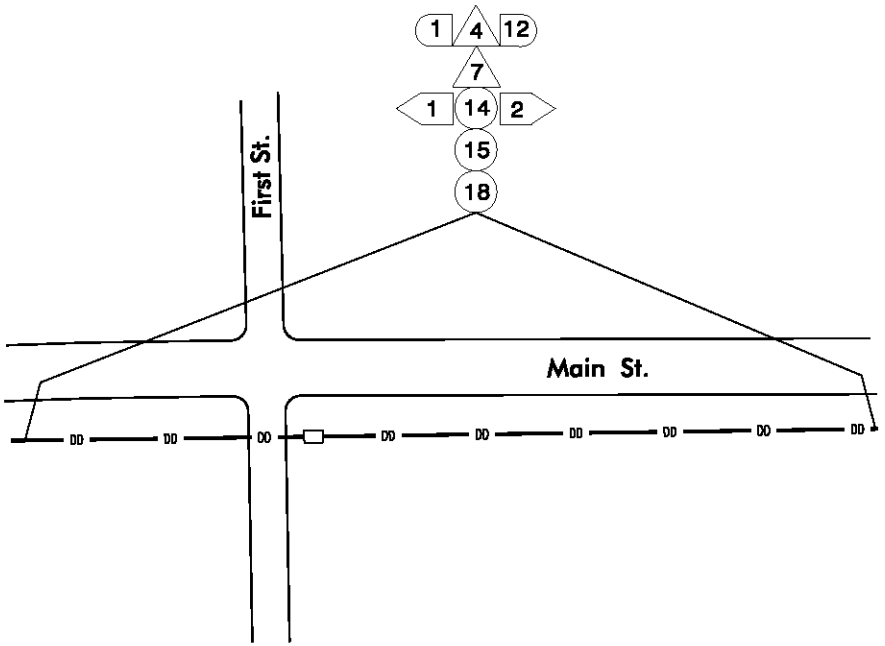
Case 3

Underground communications cable run
installed in new conduit directionally drilled



Case 4

Reserved for future use

Construction Notes for Directional Drilled Conduit

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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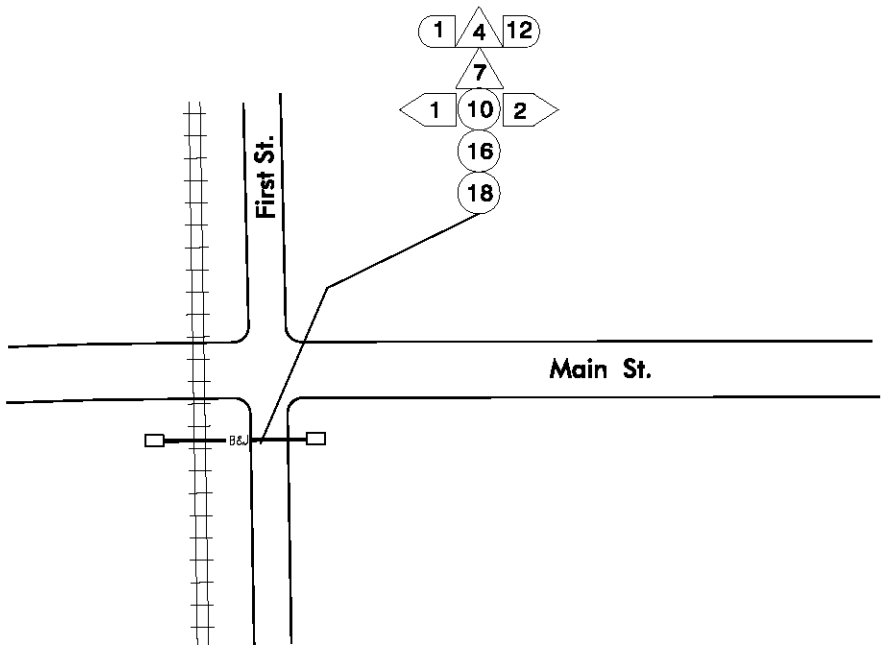
STD. NO.
4.1
SHEET 2 OF 3

Case 5

Underground communications cable run
installed in new galvanized steel conduit



NOTE:This method is typically used for crossing under railroad tracks. However, it can be used for other applications requiring galvanized steel conduit.

Case 6

Reserved for future use

Construction Notes for Bored and Jacked Conduit

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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STD. NO.
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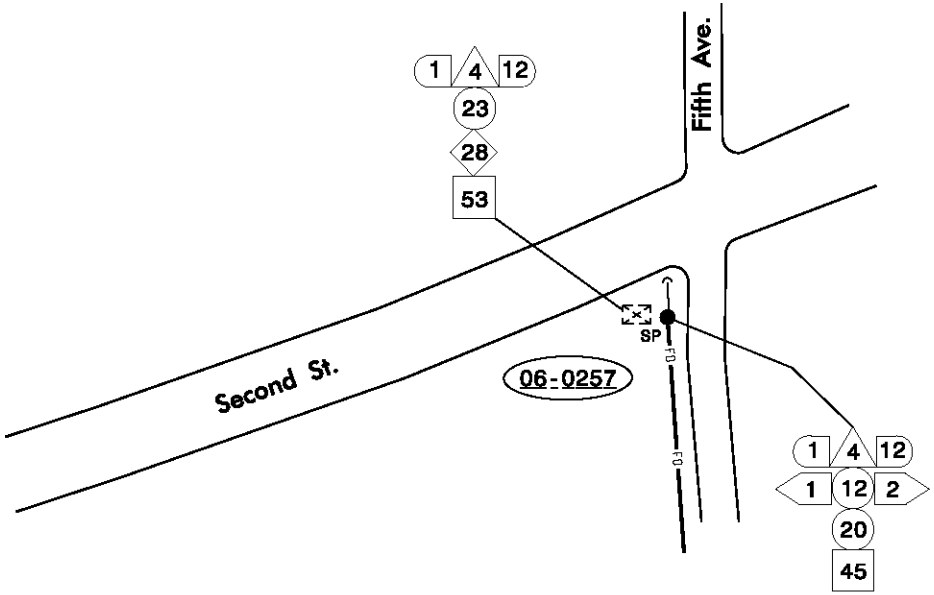
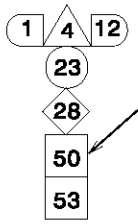
Case 1

Fiber routed from a pole riser to a base mounted signal cabinet at the end of a run with standard guy assembly

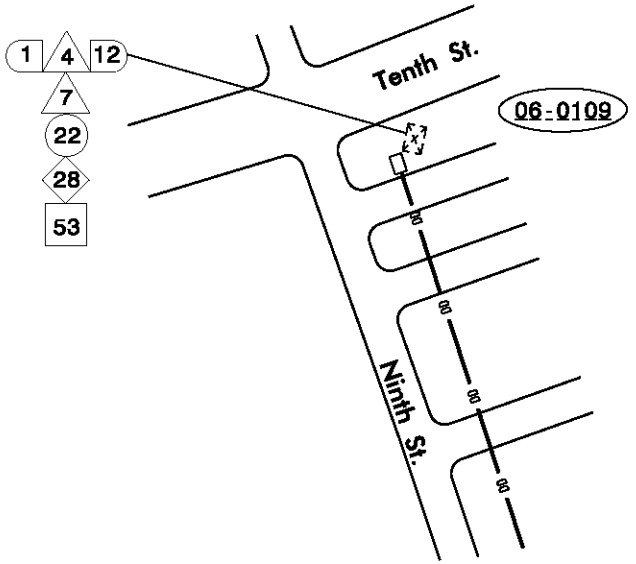


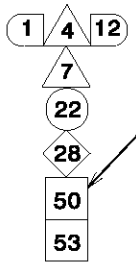


NOTE:If this is the master controller, add construction note #50.

Case 2

Fiber routed from a junction box to a base mounted signal cabinet at the end of a run (underground installation - no riser required)





NOTE:If this is the master controller, add construction note #50.

Construction Notes for Signal Cabinets and Risers

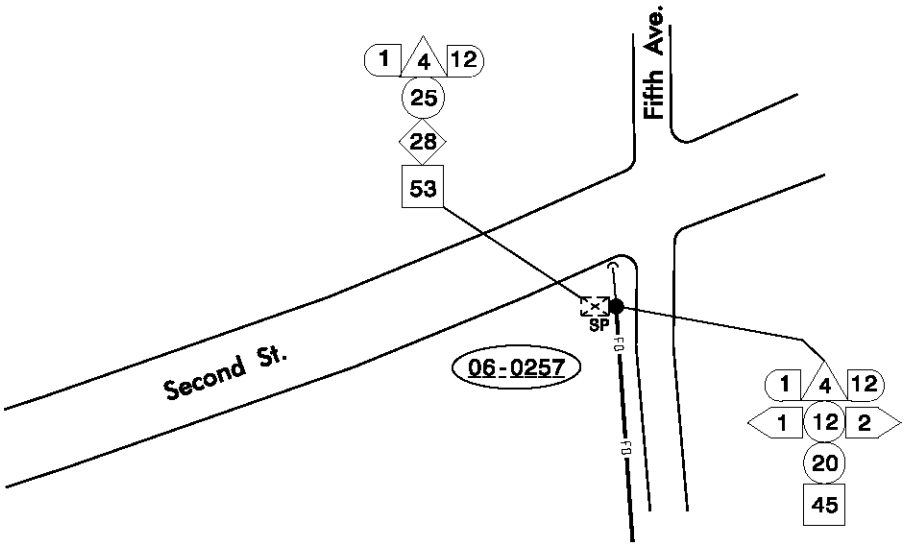
INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

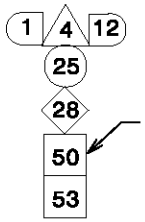
7-04

STD. NO.
4.2
SHEET 1 OF 4

Case 3

Fiber routed from a pole riser to a pole mounted signal cabinet at the end of a run with standard guy assembly

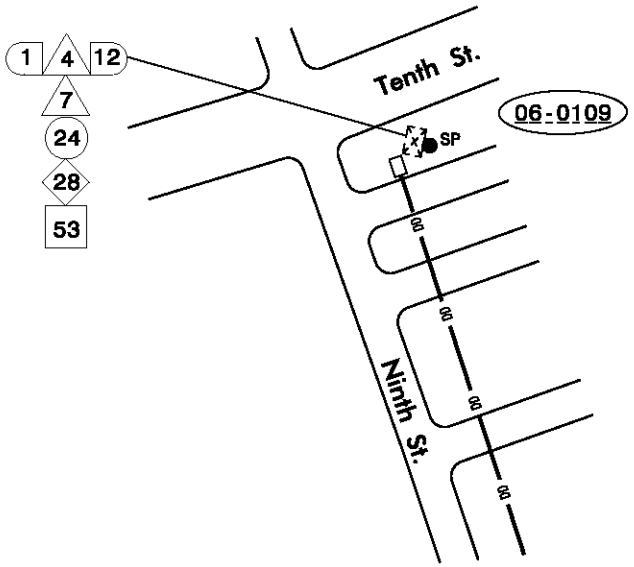


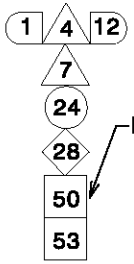


NOTE:If this is the master controller, add construction note #50.

Case 4

Fiber routed from a junction box to a pole mounted signal cabinet at the end of a run (underground installation - no riser required)





NOTE:If this is the master controller, add construction note #50.

Construction Notes for Signal Cabinets and Risers

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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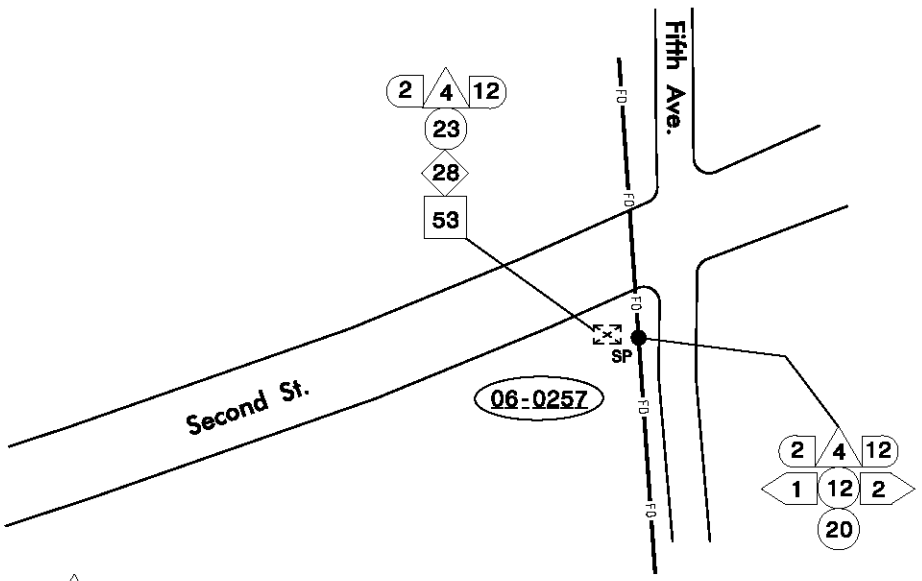
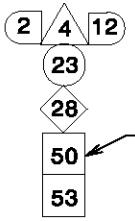
STD. NO.
4.2
SHEET 2 OF 4

Case 5

Fiber routed from a pole riser to a base mounted signal cabinet and back up through riser to continue to next location

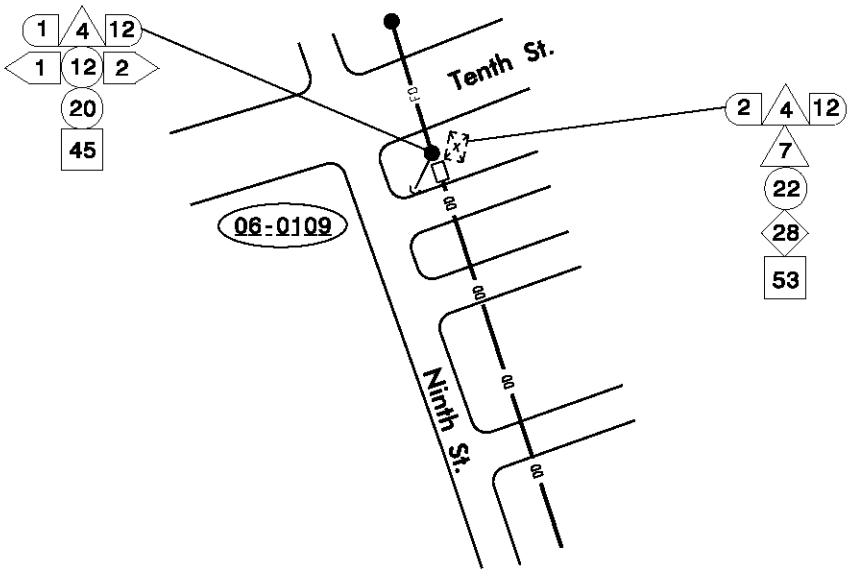


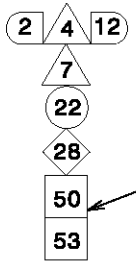


NOTE: If this is the master controller, add construction note #50.

CASE 6

Fiber routed from a junction box to a base mounted signal cabinet then up the pole riser to continue to next location (transition from underground to aerial - riser and guy required)





NOTE: If this is the master controller, add construction note #50.

Construction Notes for Signal Cabinets and Risers

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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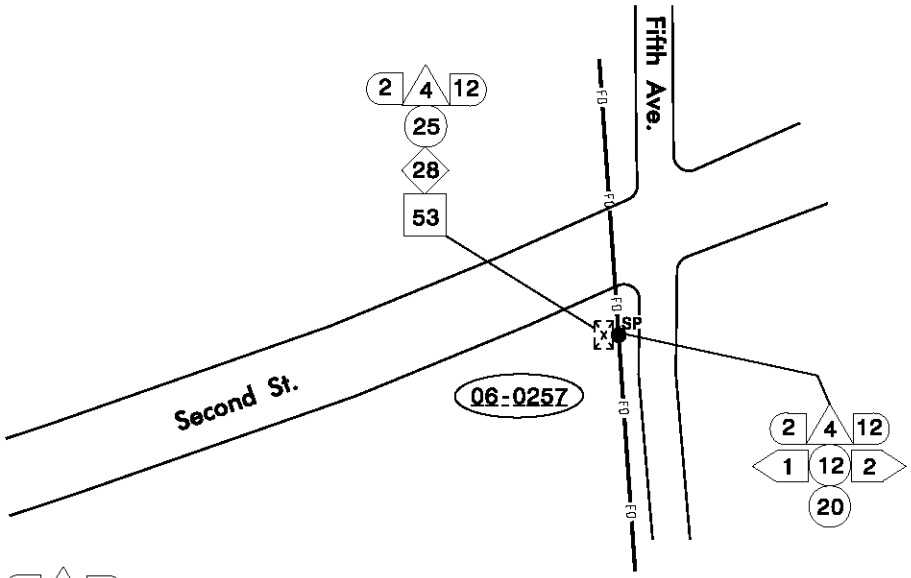
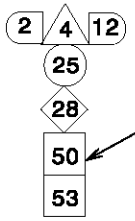
STD. NO.
4.2
SHEET 3 OF 4

Case 7

Fiber routed from a pole riser to a pole mounted signal cabinet and back up through riser to continue to next location

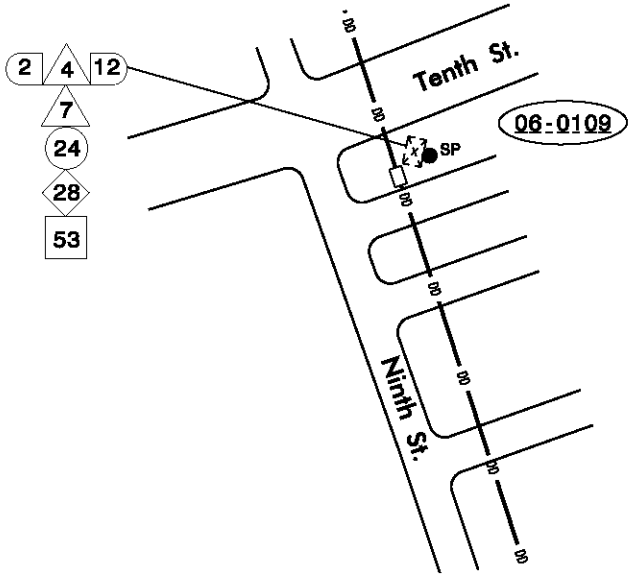


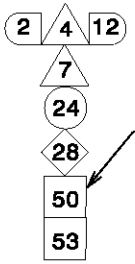


NOTE:If this is the master controller, add construction note #50.

Case 8

Fiber routed from a junction box to a base mounted signal cabinet and back to the junction to continue to next location (underground installation - no riser required)





NOTE:If this is the master controller, add construction note #50.

Construction Notes for Signal Cabinets

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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4.2
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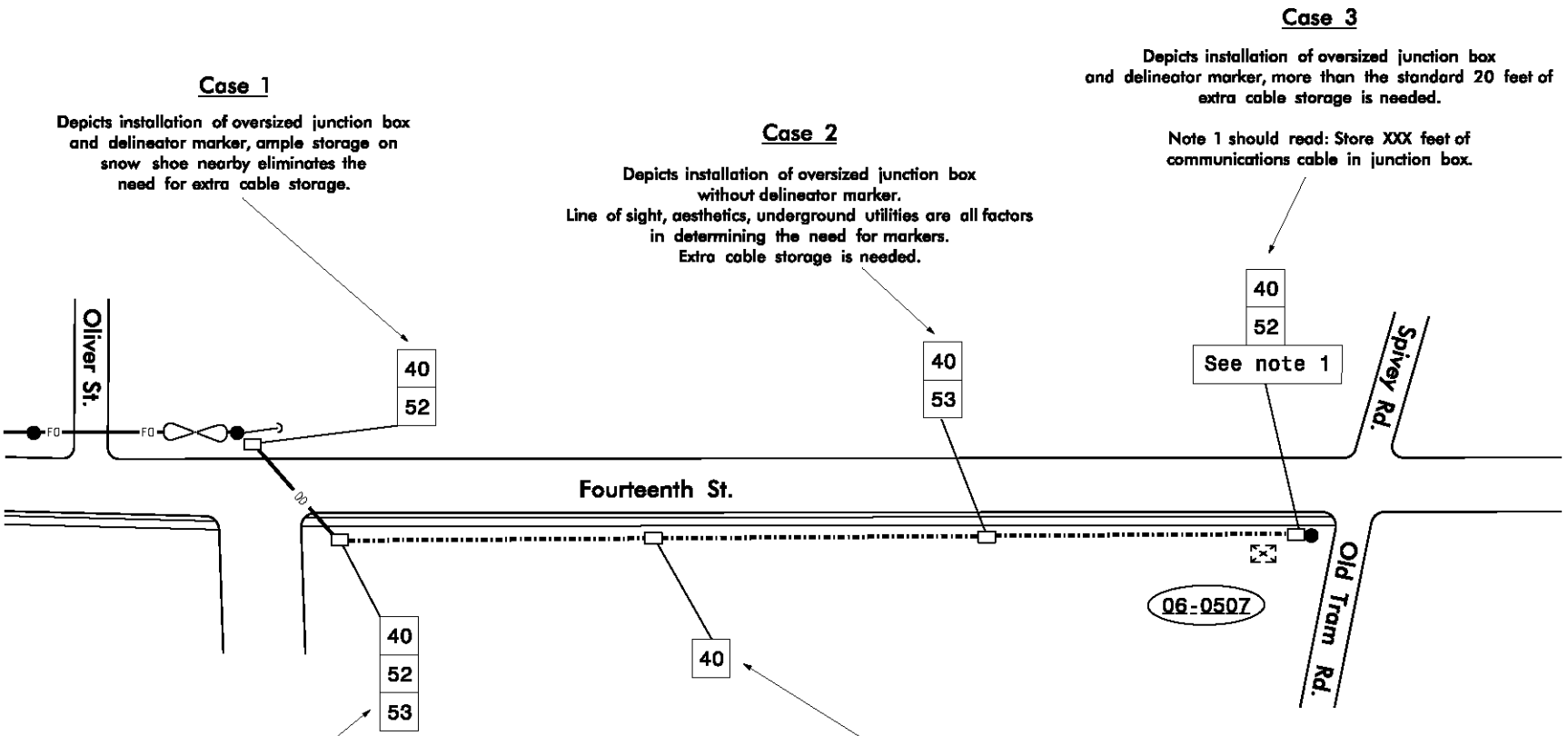

Note: Distance between junction boxes may vary.

Construction Notes for Oversized Junction Box

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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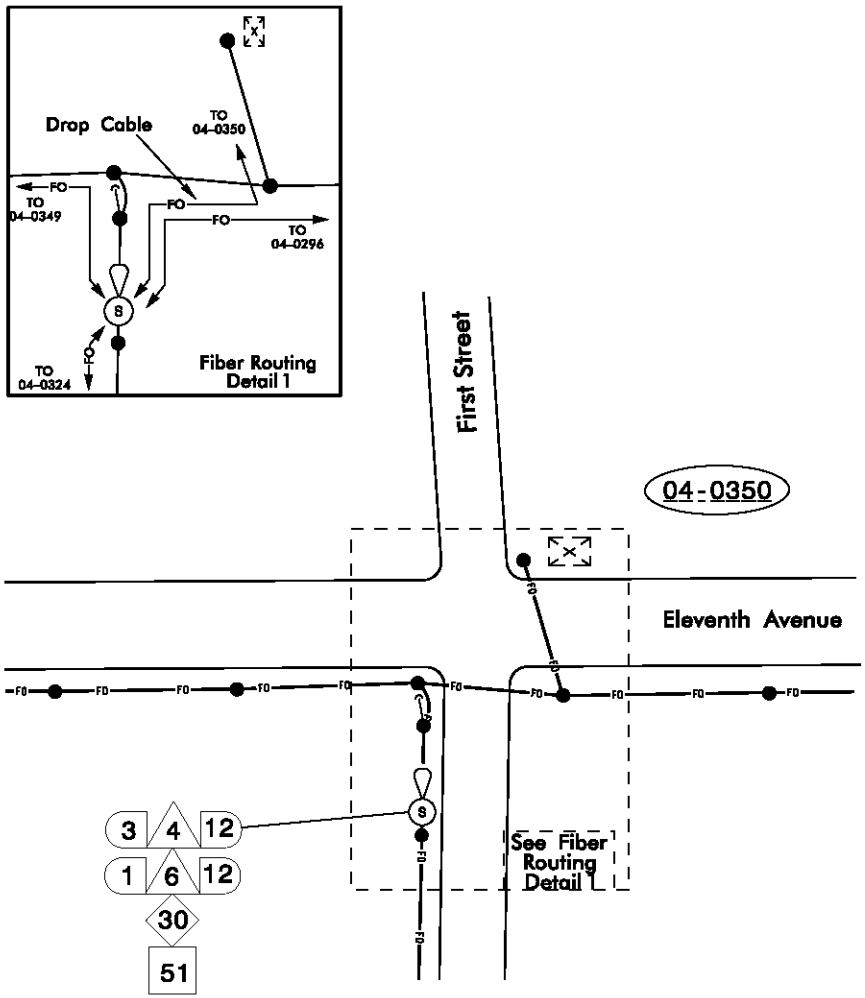
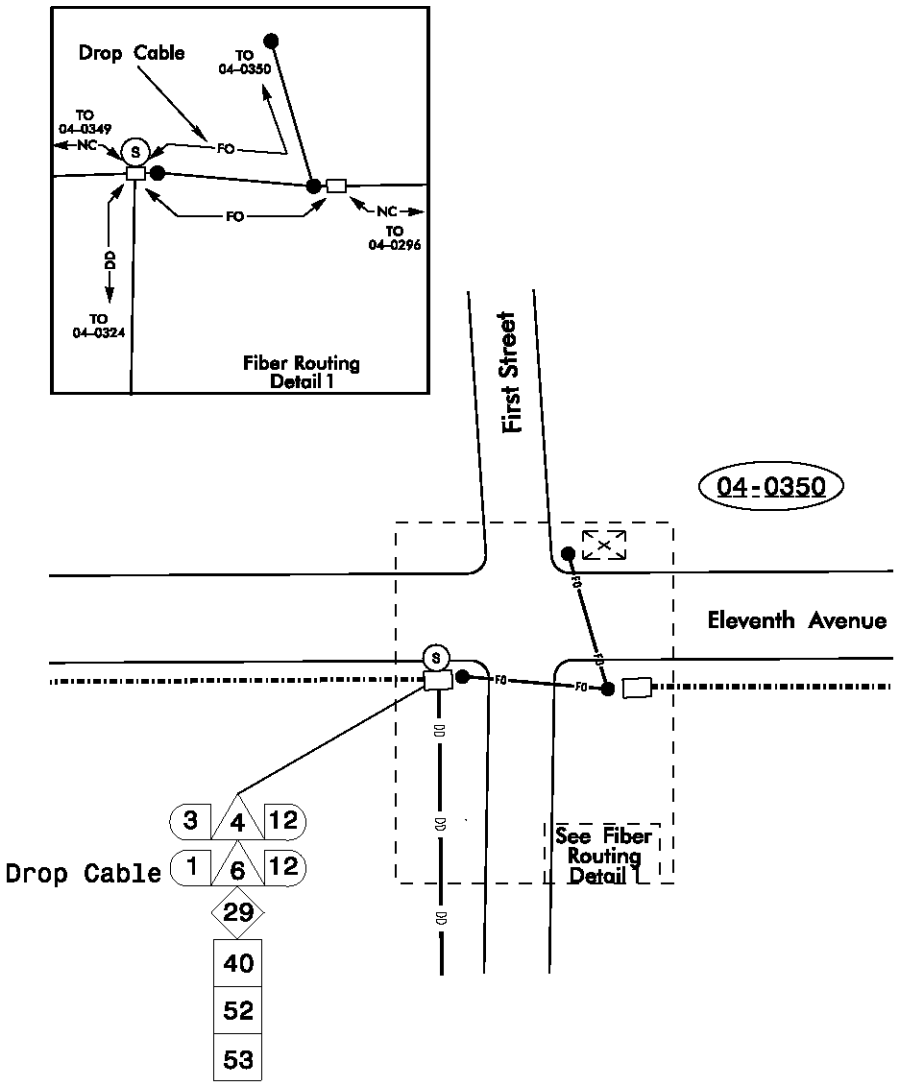




Fiber Routing Detail Drawing for Splice Enclosures

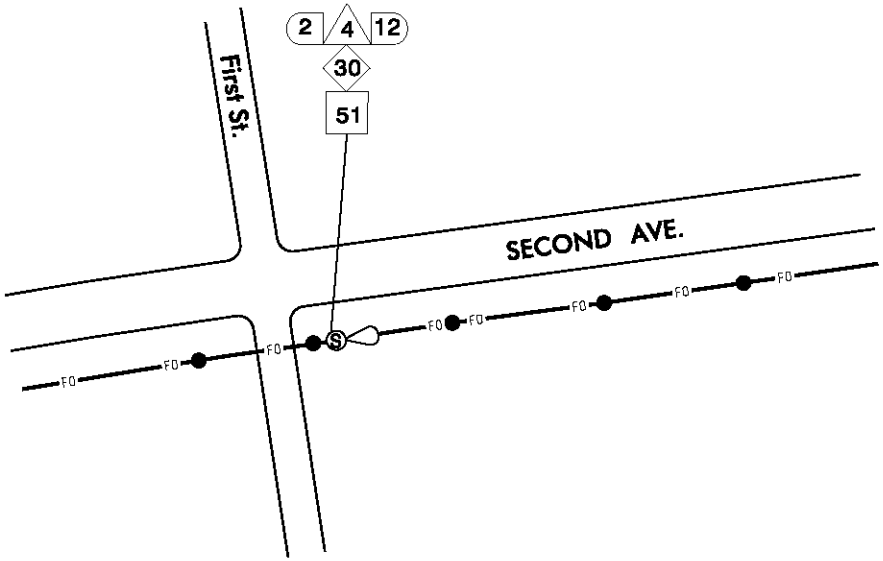
INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
4.4
SHEET 1 OF 4

Case 1

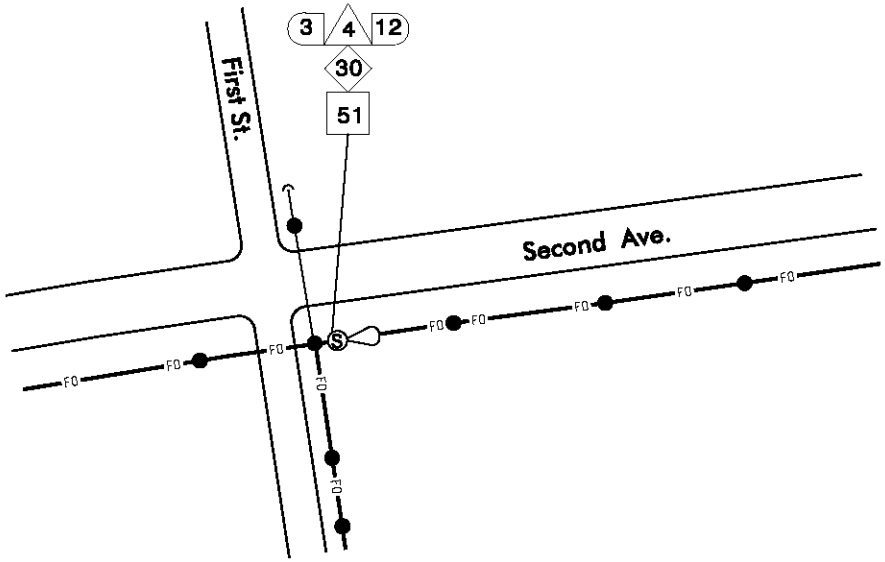
Cable routed to an aerial splice enclosure
with one cable in and one cable out



NOTE: In this case, the splice enclosure would be for a future traffic signal, camera, or dynamic message sign. This is also the method used for tying into an existing cable left terminated at the pole.

Case 2

Cable routed to an aerial splice enclosure
with one cable in and two cables out



Construction Notes for Splice Enclosures

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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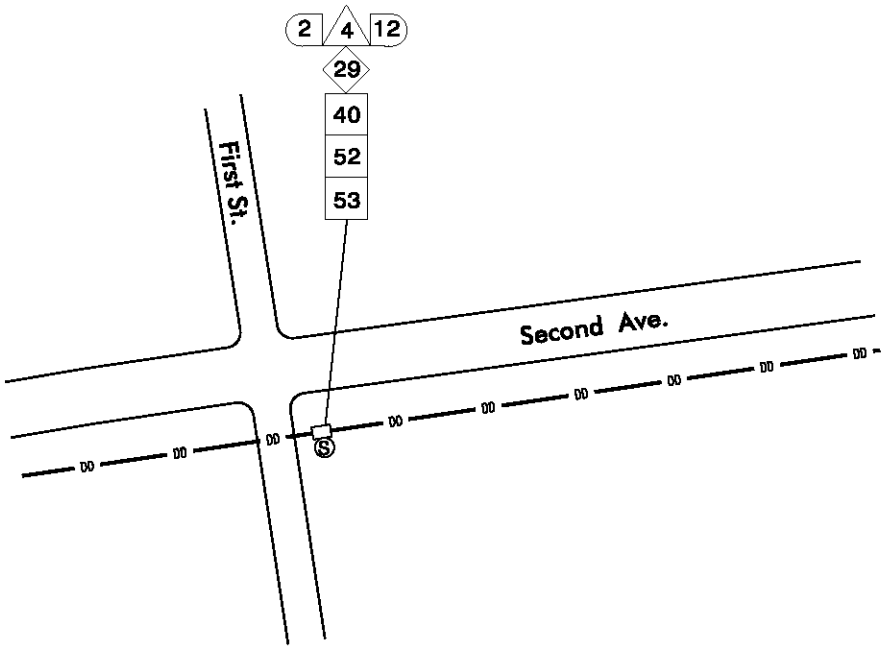
STD. NO.
4.4
SHEET 2 OF 4

Case 3

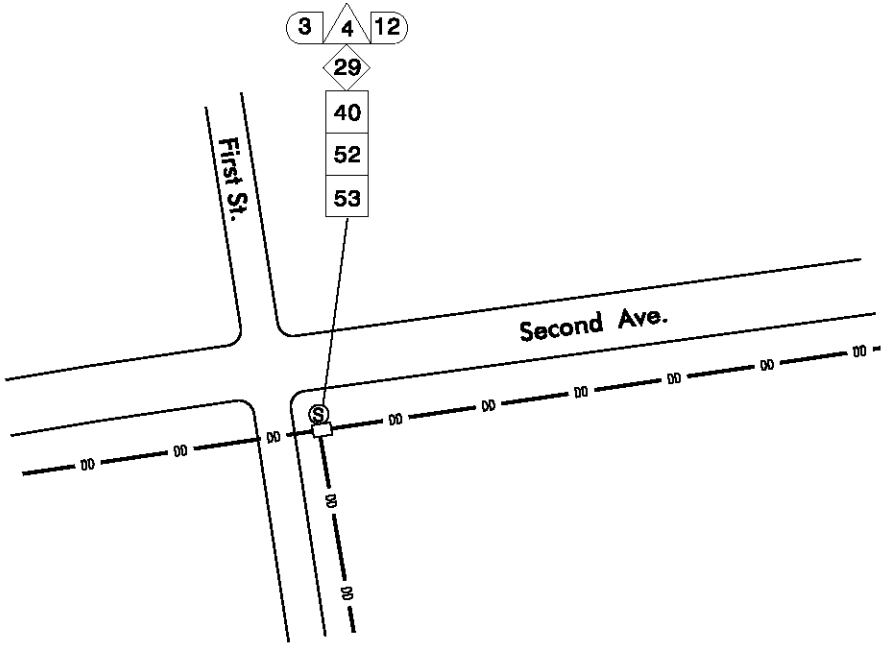
Cable routed to an underground splice enclosure
with one cable in and one cable out



NOTE: In this case, the splice enclosure would be for a future traffic signal, camera, or dynamic message sign. This is also the method used for tying into an existing cable left terminated at the junction box.

Case 4

Cable routed to an underground splice enclosure
with one cable in and two cables out



Construction Notes for Splice Enclosures

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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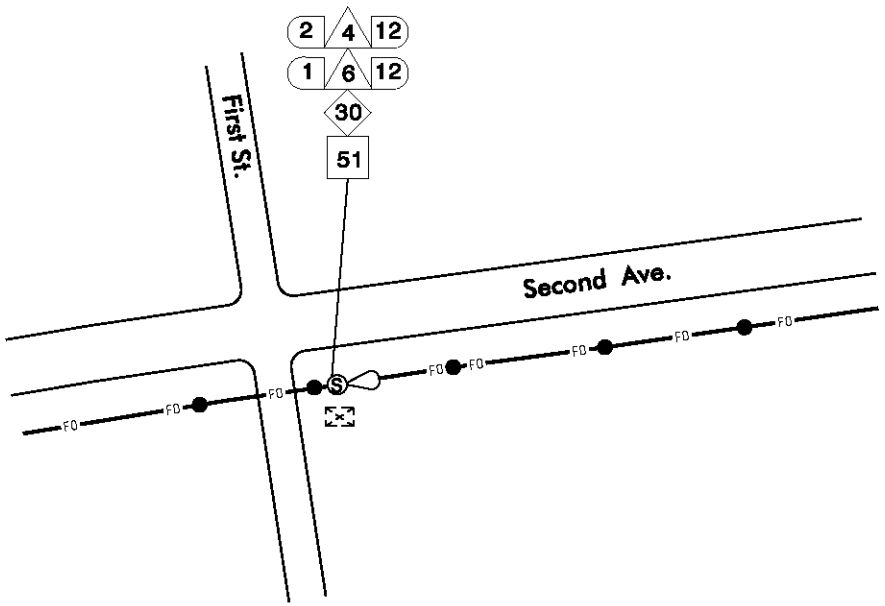
STD. NO.
4.4
SHEET 3 OF 4

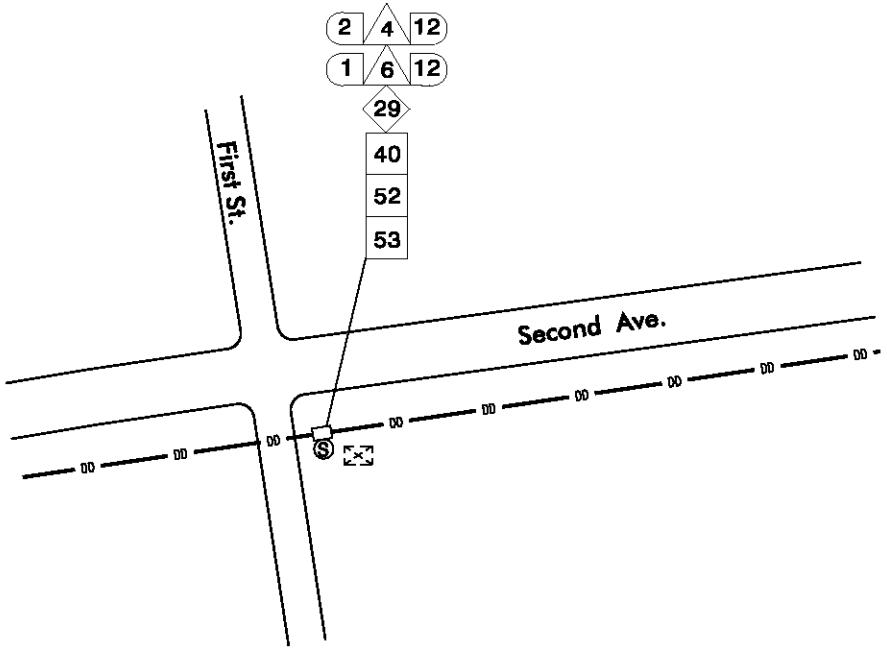
Case 5

Cable routed to an aerial splice enclosure
with one trunk cable in, one trunk cable out
and a drop cable routed to a cabinet



Case 6

Cable routed to an underground splice enclosure
with one trunk cable in, one trunk cable out
and a drop cable routed to a cabinet



Construction Notes for Splice Enclosures

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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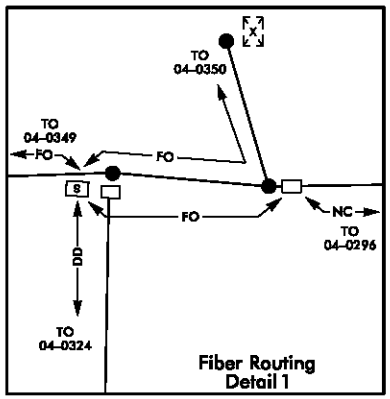
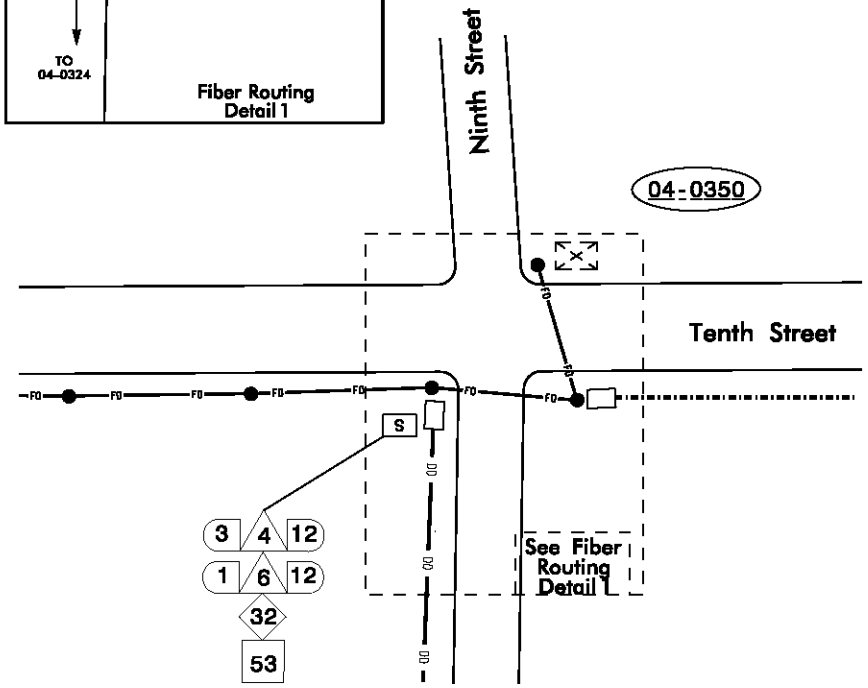
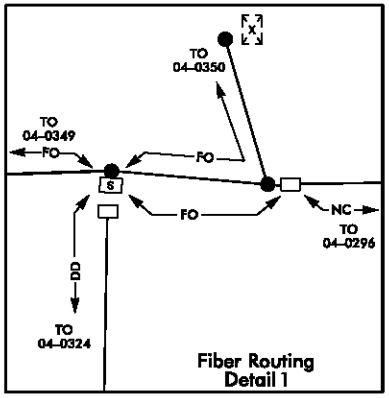
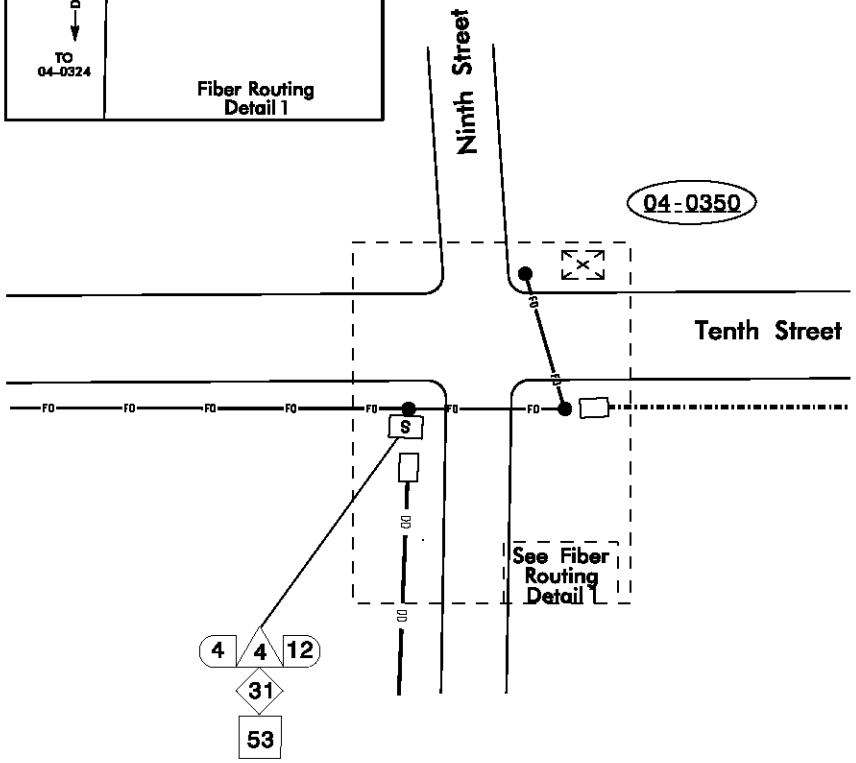
STD. NO.
4.4
SHEET 4 OF 4









Fiber Routing Detail Drawing for Splice Cabinets

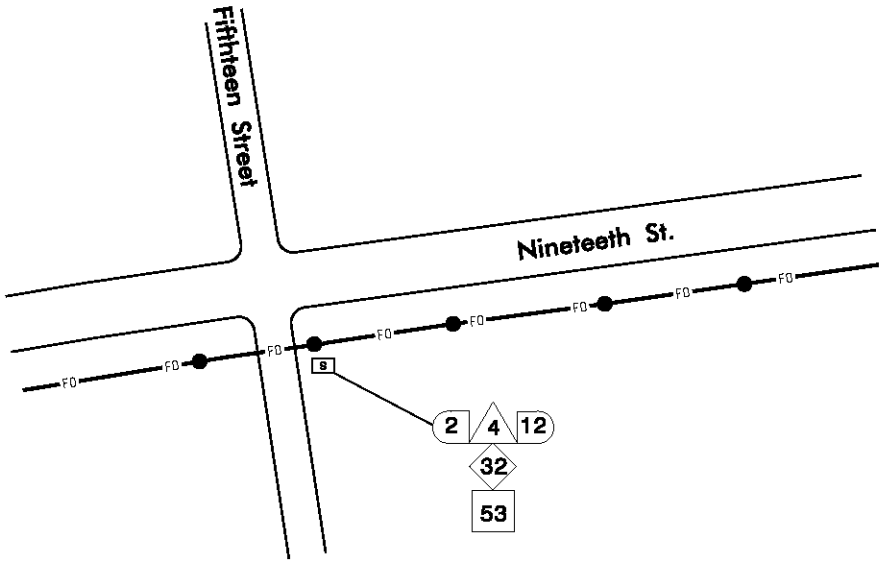
INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
4.5
SHEET 1 OF 5

Case 1

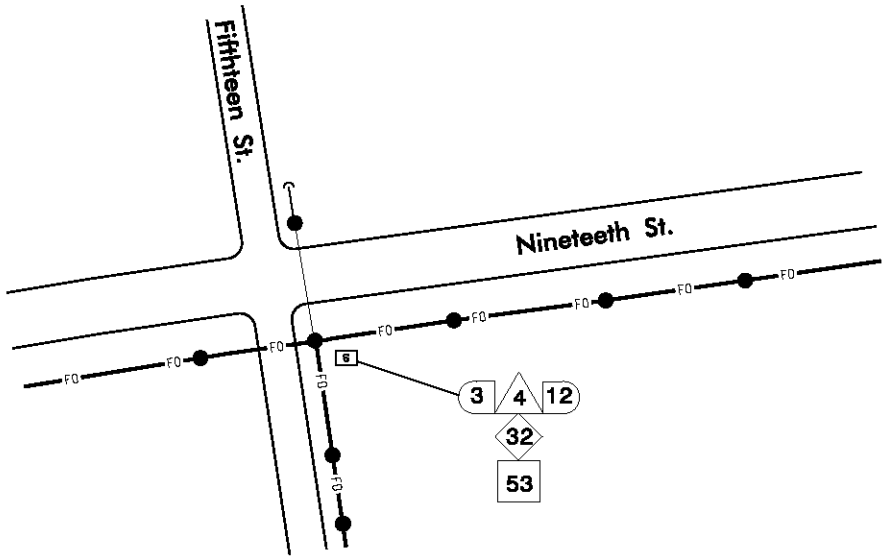
Aerial cable run routed through a riser
to a base mounted splice cabinet
with one in and one cable out



NOTE: In this case, the splice cabinet would be for a future traffic signal, camera, or dynamic message sign. This is also the method used for tying into an existing cable left terminated at the pole.

Case 2

Aerial cable run routed through a riser
to a base mounted splice cabinet
with one cable in and two cables out



Construction Notes for Splice Cabinets

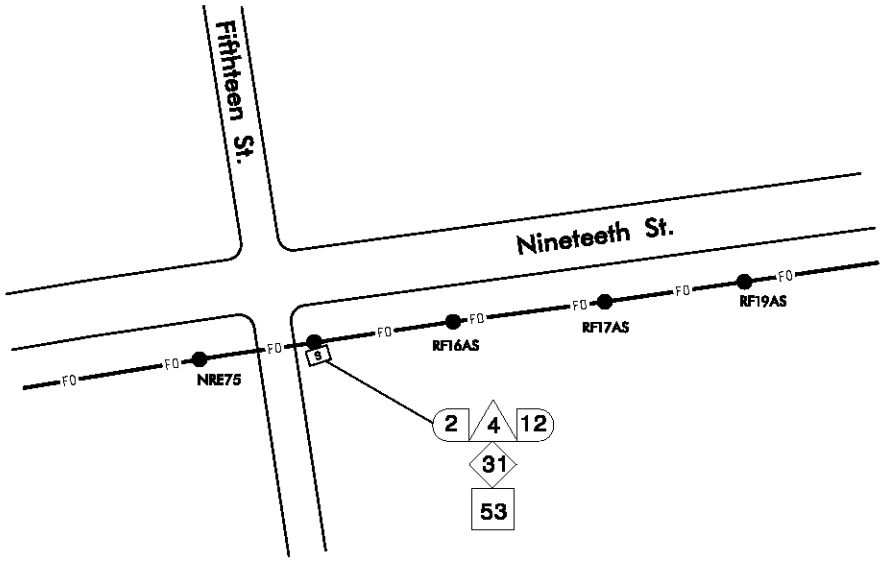
INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
4.5
SHEET 2 OF 5

Case 3

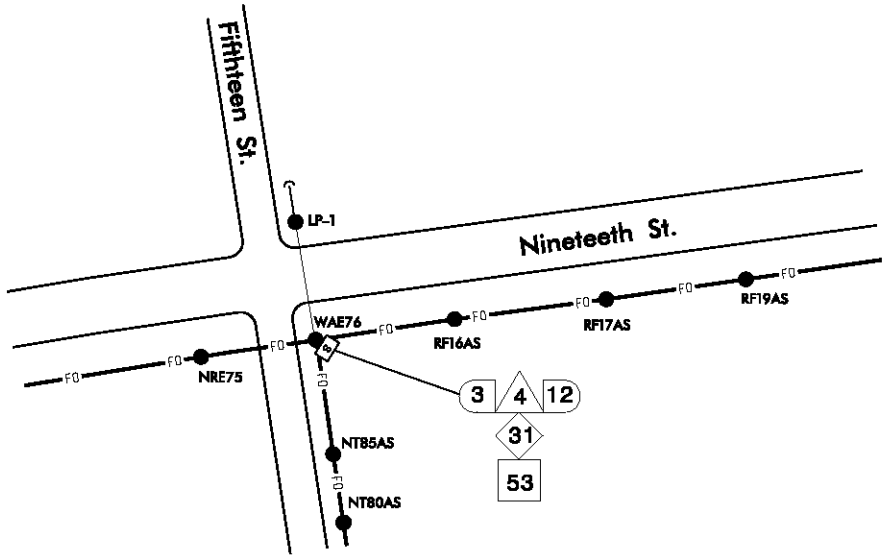
Aerial cable run routed through a riser
to a pole mounted splice cabinet
with one cable in and one cable out



NOTE: In this case, the splice cabinet would be for a future traffic signal, camera, or dynamic message sign. This is also the method used for tying into an existing cable left terminated at the pole.

Case 4

AERIAL CABLE RUN ROUTED THROUGH A RISER
TO A POLE MOUNTED SPLICE CABINET
WITH ONE CABLE IN AND TWO CABLES OUT



Construction Notes for Splice Cabinets

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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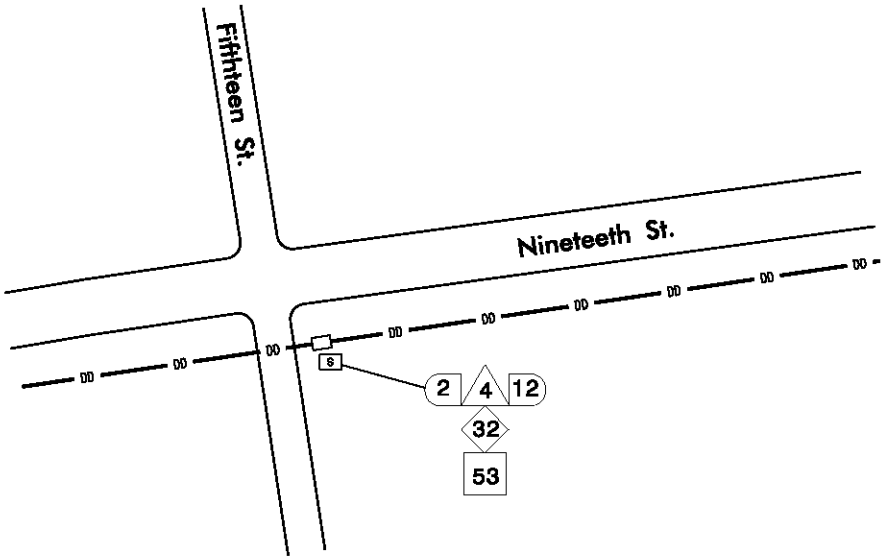
STD. NO.
4.5
SHEET 3 OF 5

Case 5

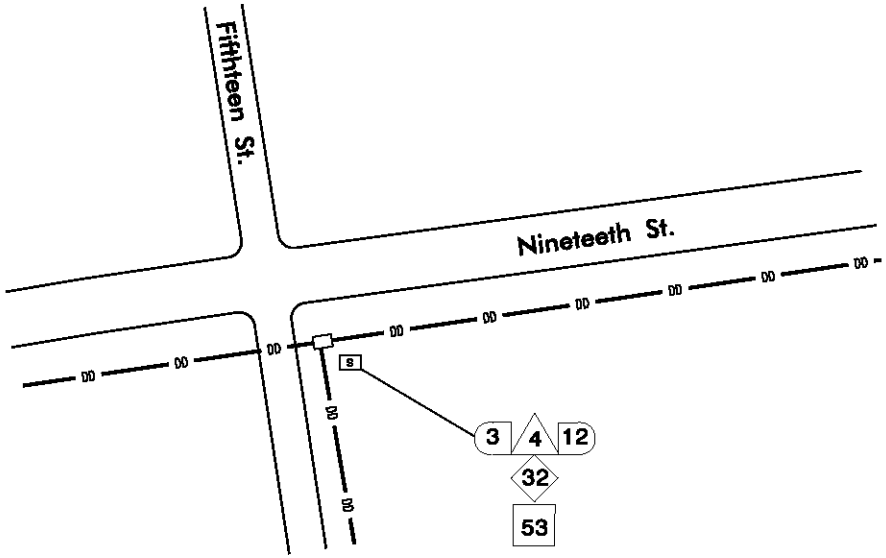
Underground cable run routed through a junction box
to a base mounted splice cabinet
with one cable in and one cable out



NOTE: In this case, the splice cabinet would be for a future traffic signal, camera, or dynamic message sign. This is also the method used for tying into an existing cable left terminated at the junction box.

Case 6

Underground cable run through a junction box
to a base mounted splice cabinet
with one cable in and two cables out



Construction Notes for Splice Cabinets

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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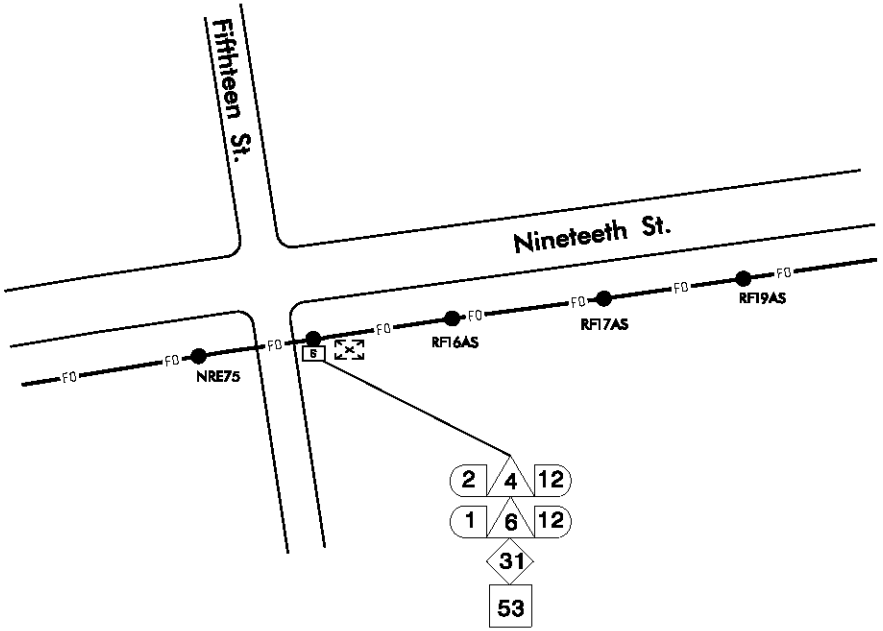
STD. NO.
4.5
SHEET 4 OF 5

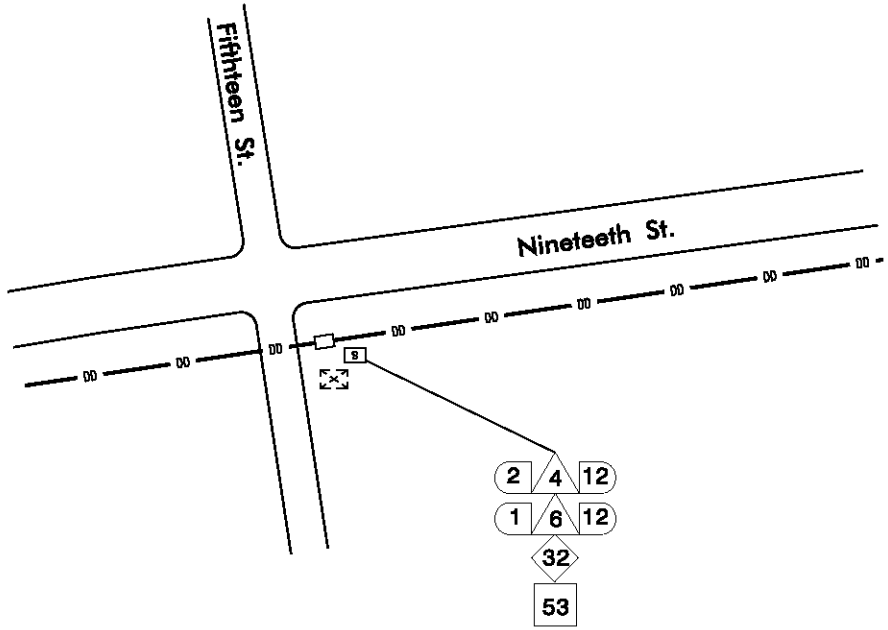
Case 7

Cable routed to a pole splice cabinet
with one trunk cable in, one trunk cable out
and a drop cable routed to a cabinet



Case 8

Cable routed to a base mounted splice cabinet
with one trunk cable in, one trunk cable out
and a drop cable routed to a cabinet



Construction Notes for Splice Cabinets

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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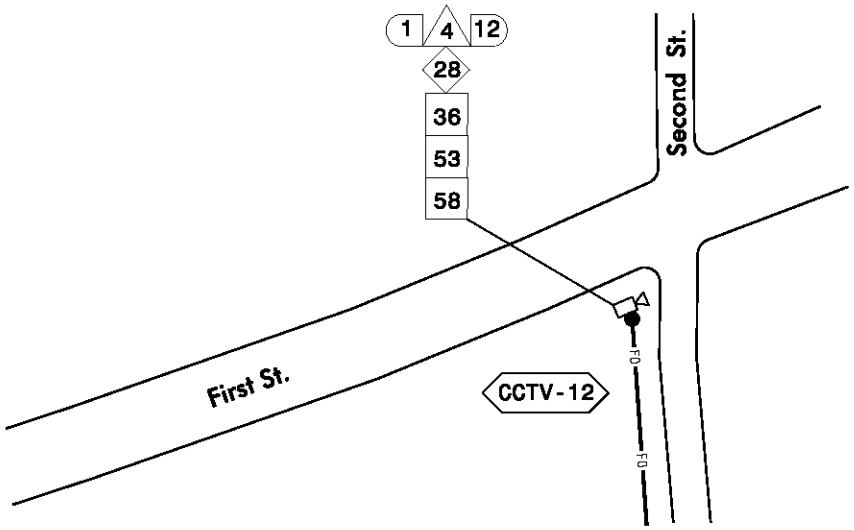
STD. NO.
4.5
SHEET 5 OF 5

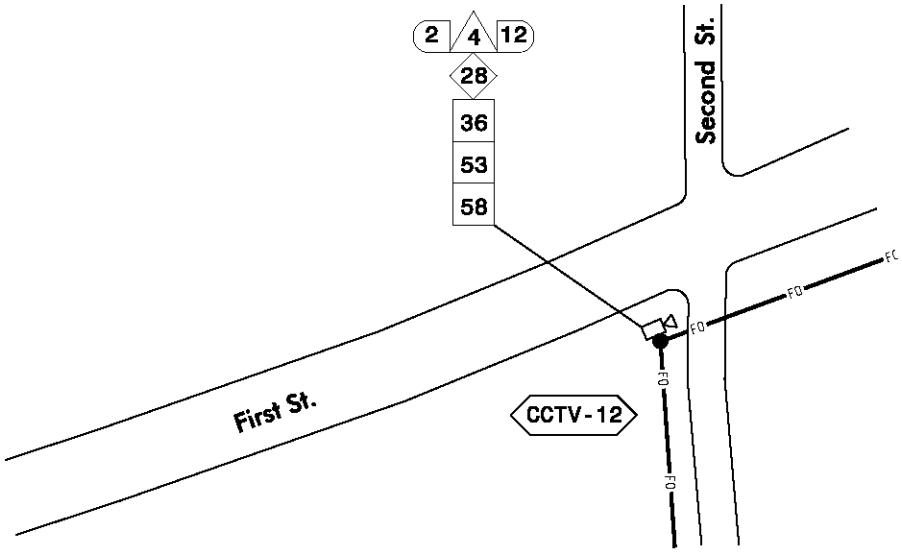
Case 1

CCTV assembly mounted on an existing pole
at the end of a run



Case 2

CCTV assembly on an existing pole
in the middle of a run



Construction Notes for CCTV Camera Assemblies

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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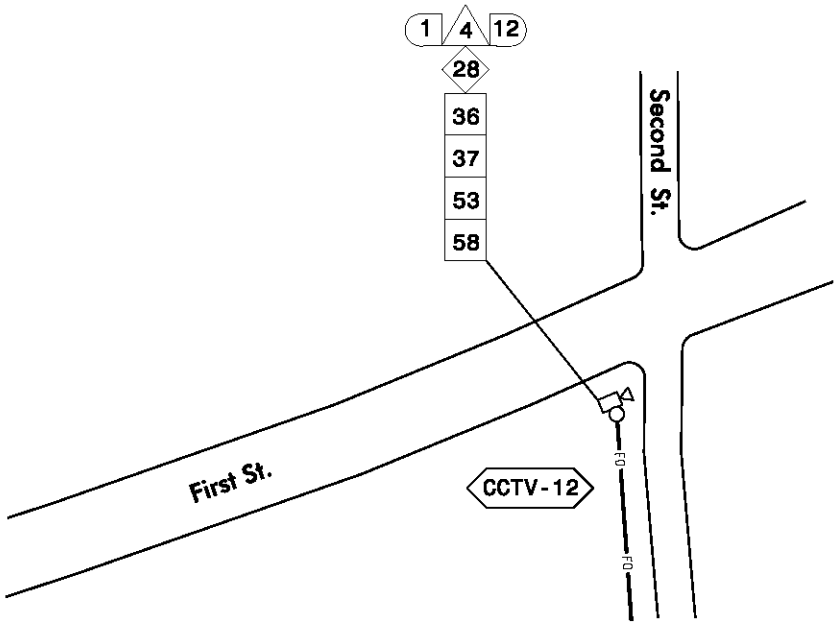
5.0
SHEET 1 OF 3

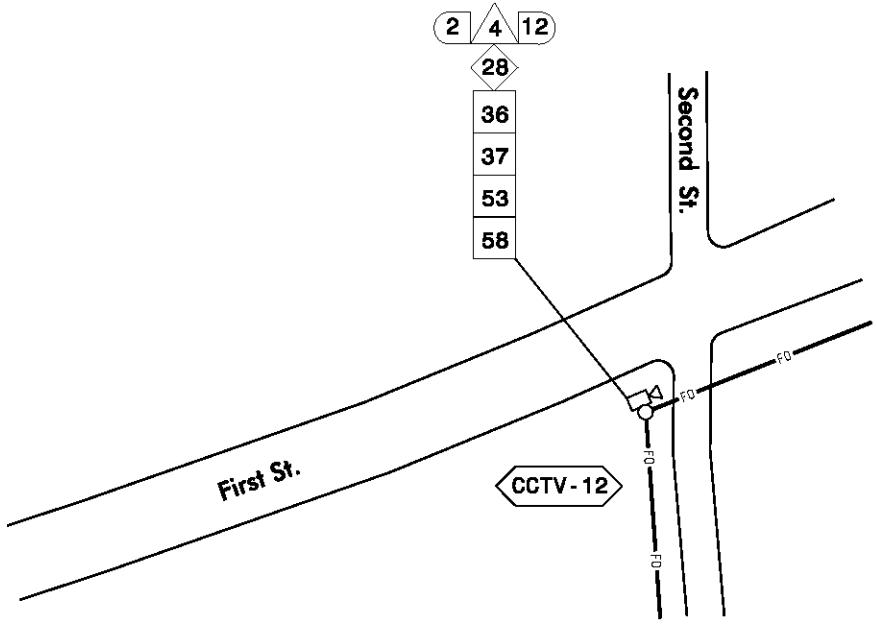
Case 3

CCTV assembly mounted on a new wood pole
at the end of a run



Case 4

CCTV assembly mounted on a new wood pole
in the middle of a run



Construction Notes for CCTV Camera Assemblies

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
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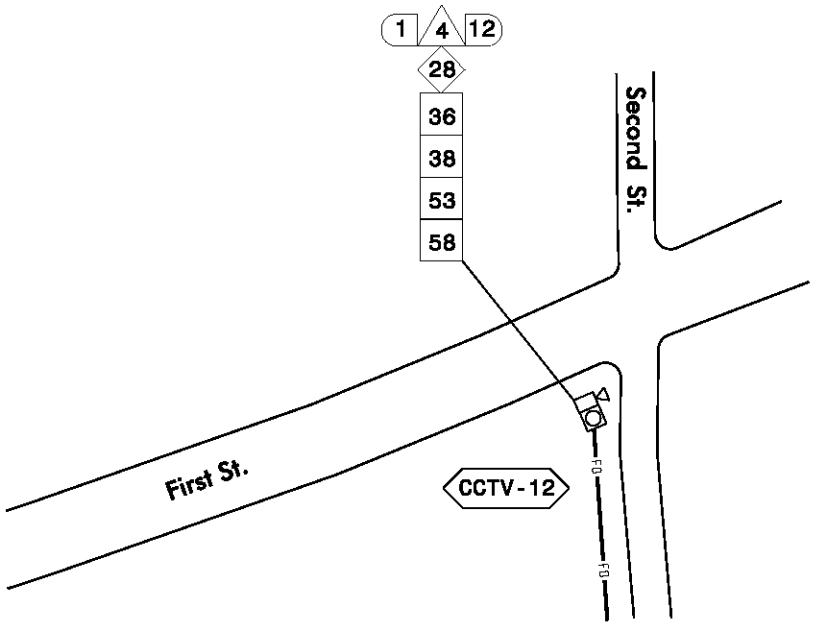
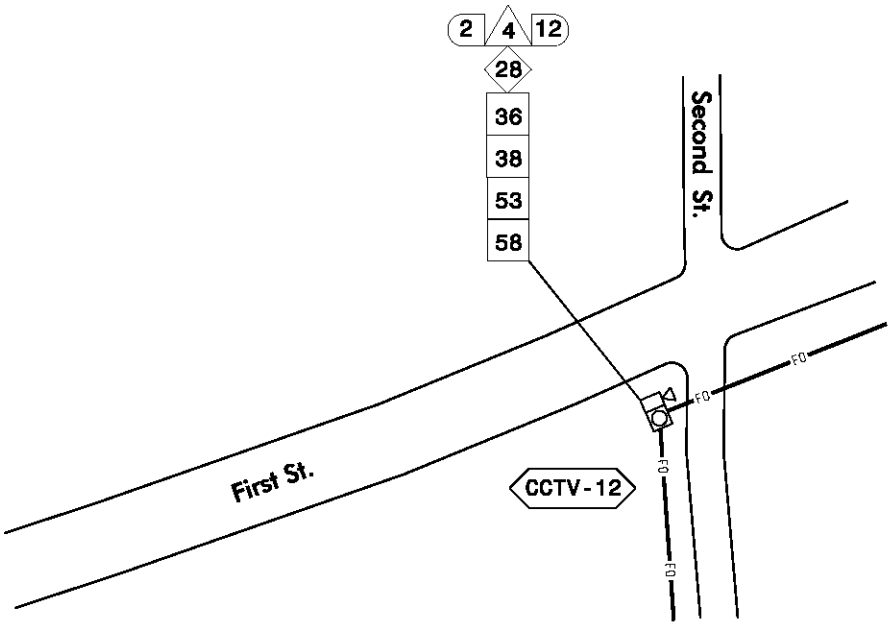
Case 5

CCTV assembly mounted on a new metal pole
at the end of a run



Case 6

CCTV assembly mounted on a new metal pole
in the middle of a run



Construction Notes for CCTV Camera Assemblies

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
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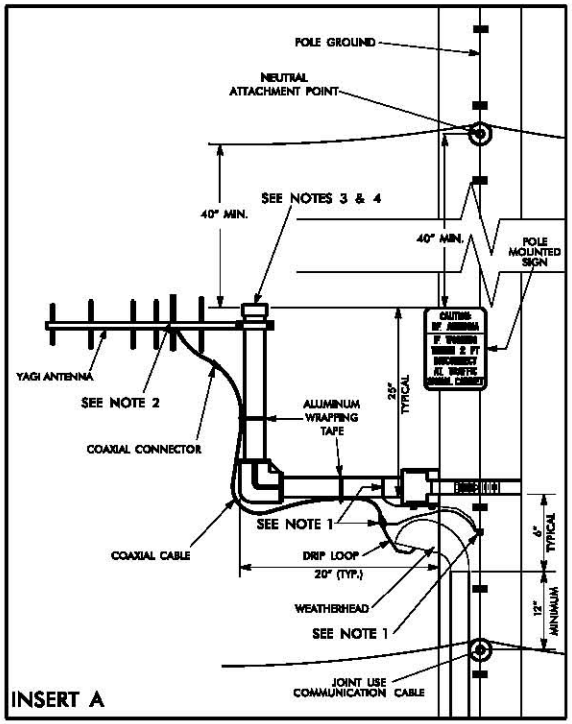

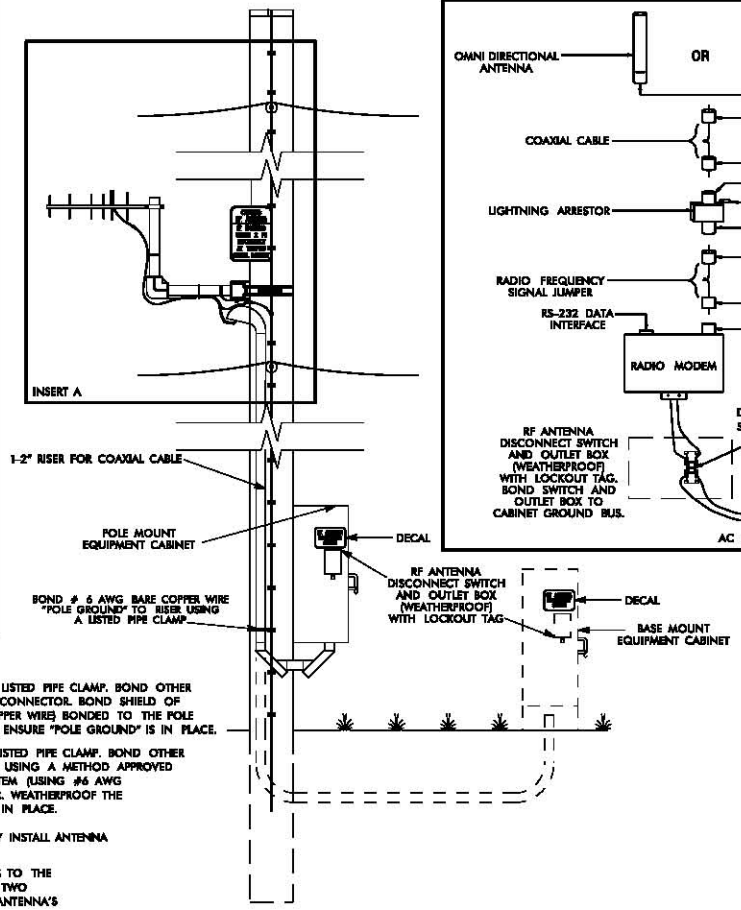

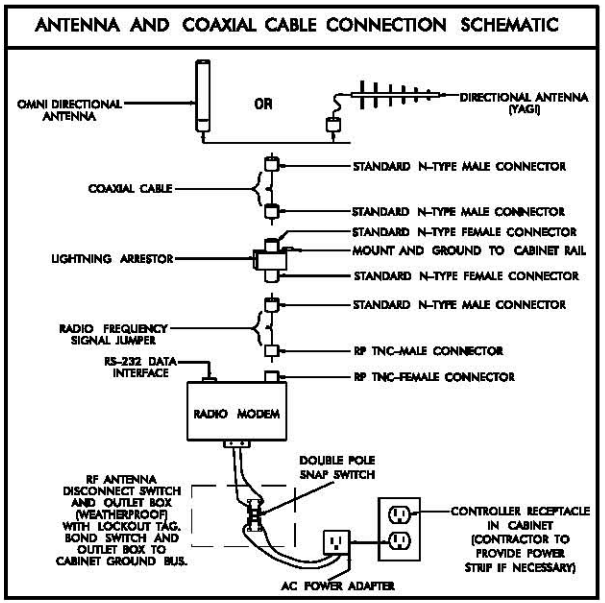

NOTES

1. WOOD POLE — BOND # 6 AWG SOLID BARE COPPER WIRE TO ANTENNA SUPPORT USING LISTED PIPE CLAMP. BOND OTHER END OF # 6 AWG SOLID BARE COPPER WIRE TO THE POLE GROUND USING A SPLIT BOLT CONNECTOR. BOND SHIELD OF COAXIAL CABLE WITH AN APPROVED GROUNDING SYSTEM (USING #6 AWG STRANDED COPPER WIRE) BONDED TO THE POLE GROUND. WEATHERPROOF THE CONNECTION ONCE THE GROUNDING SYSTEM IS INSTALLED. ENSURE "POLE GROUND" IS IN PLACE.

   METAL POLE — BOND # 6 AWG SOLID BARE COPPER WIRE TO ANTENNA SUPPORT USING LISTED PIPE CLAMP. BOND OTHER END OF # 6 AWG SOLID BARE COPPER WIRE TO THE POLE OR EXISTING SYSTEM GROUND USING A METHOD APPROVED BY THE ENGINEER. BOND SHIELD OF COAXIAL CABLE WITH AN APPROVED GROUNDING SYSTEM (USING #6 AWG STRANDED COPPER WIRE) BONDED TO THE POLE BY A METHOD APPROVED BY THE ENGINEER. WEATHERPROOF THE CONNECTION ONCE THE GROUNDING SYSTEM IS INSTALLED. ENSURE "SYSTEM GROUND" IS IN PLACE.

2. YAGI ANTENNA SHOWN IN VERTICAL POLARIZATION POSITION FOR CLARIFICATION. TYPICALLY INSTALL ANTENNA IN HORIZONTAL POLARIZATION POSITION.

3. TO CONSERVE VERTICAL SPACING ON THE POLE (JOINT-USE OR SIGNAL POLE) WITH REGARDS TO THE SURROUNDING UTILITIES, INSTALL THE ANTENNA MOUNTING HARDWARE USING ONE OF THE TWO METHODS LISTED BELOW: (ENSURE THAT THE MOUNTING METHOD DOES NOT DEGRADE THE ANTENNA'S SIGNAL INTEGRITY)
   A) ROTATE THE VERTICAL SUPPORT ARM 90 DEGREES SUCH THAT THE ANTENNA IS AT THE SAME HEIGHT AS THE HORIZONTAL SUPPORT ARM.
   B) ELIMINATE THE VERTICAL SUPPORT ARM AND MOUNT THE ANTENNA TO THE HORIZONTAL SUPPORT ARM.
   C) ANTENNA, ANTENNA SUPPORT ARM, AND SIGN TO MAINTAIN A 40" SEPARATION FROM NEUTRAL/POWER AND 12" FROM OTHER UTILITIES.

4. INSTALL AN END CAP TO SEAL THE EXPOSED END OF THE MOUNTING PIPE.

Wireless Communications – Typical Detail

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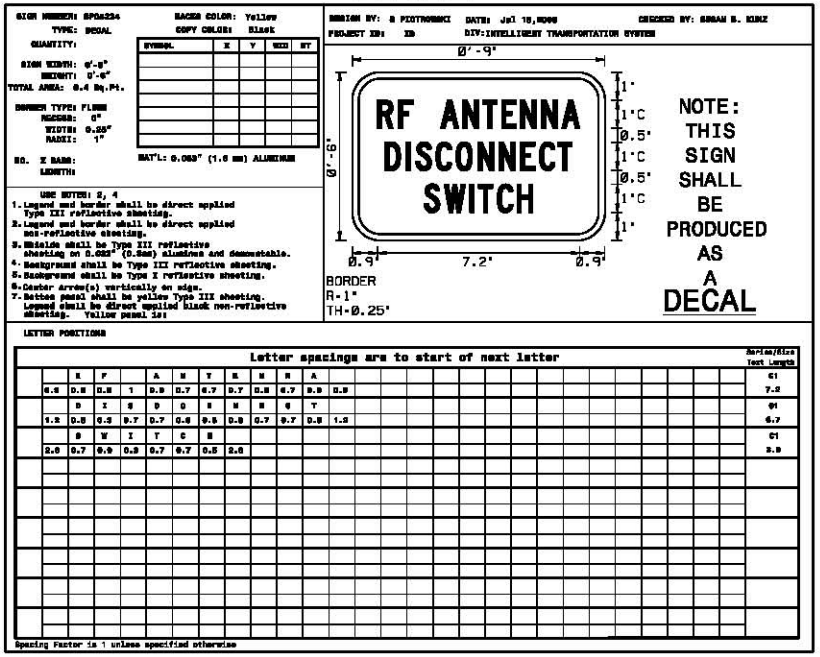
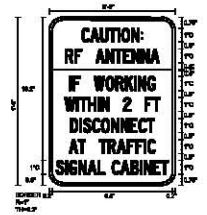
DECAL



POLE MOUNTED SIGN



0.60 SPACING FACTOR

Wireless Communications – Typical Detail

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
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LEGEND

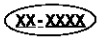

YAGI ANTENNA (DOUBLE) FOR REPEATER OPERATION


YAGI ANTENNA (SINGLE)

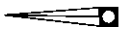

OMNI ANTENNA


EXISTING CONTROLLER AND CABINET


EXISTING MASTER CONTROLLER AND CABINET



SIGNAL INVENTORY NUMBER


EXISTING METAL POLE W/MAST ARM


EXISTING WOOD POLE


NEW METAL POLE

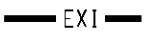
SP
SIGNAL POLE


EXISTING METAL POLE


NEW OVERSIZED JUNCTION BOX


EXISTING OVERSIZED JUNCTION BOX

EXISTING CONDUIT



EXISTING COMMUNICATIONS CABLE

NOTES FOR WIRELESS COMMUNICATIONS:

1. INSTALL COAXIAL CABLE:
   - A. ON WOOD POLES, REQUIRING A NEW RIGID GALVANIZED STEEL RISER, INSTALL A 2" RISER WITH WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   - B. ON METAL POLES WITH MAST ARMS, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL A 1/2" HOLE UP THROUGH THE BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
   - C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   - D. BETWEEN THE POINT OF EXITING THE RISER, METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
2. IF AN EXISTING 2" SPARE RIGID GALVANIZED STEEL RISER IS AVAILABLE, INSTALL THE COAXIAL CABLE IN THE SPARE RISER.
3. INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN.
   (NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT–OWNED POLE.)
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET.
   (NOTE: RF ANTENNA DISCONNECT SWITCH AND DECAL ARE NOT REQUIRED WHEN THE ANTENNA IS INSTALLED ON AN NCDOT–OWNED POLE.)
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."

Wireless Communications – Typical Plan Sheet Notes & Legend

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
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WIRELESS – STANDARD CONSTRUCTION NOTES

YAGI VERTICALLY POLARIZED

INSTALL 8.5 DB GAIN YAGI ANTENNA VERTICALLY POLARIZED

INSTALL 13 DB GAIN YAGI ANTENNA VERTICALLY POLARIZED

YAGI HORIZONTALLY POLARIZED

INSTALL 8.5 DB GAIN YAGI ANTENNA HORIZONTALLY POLARIZED

INSTALL 13 DB GAIN YAGI ANTENNA HORIZONTALLY POLARIZED

OMNI VERTICALLY POLARIZED

INSTALL 3 DB GAIN OMNI ANTENNA VERTICALLY POLARIZED

INSTALL 6 DB GAIN OMNI ANTENNA VERTICALLY POLARIZED

ATTACHMENT NOTES

ATTACH ANTENNA 12" ABOVE SIGNAL CABLE

ATTACH ANTENNA 6" ABOVE SIGNAL CABLE

ATTACH ANTENNA 12" ABOVE SIGNAL CABLE WEATHERHEAD

ATTACH ANTENNA 6" ABOVE SIGNAL CABLE WEATHERHEAD

ATTACH ANTENNA 12" BELOW SIGNAL CABLE

ATTACH ANTENNA 6" BELOW SIGNAL CABLE

ATTACH ANTENNA 12" BELOW SIGNAL CABLE WEATHERHEAD

ATTACH ANTENNA 6" BELOW SIGNAL CABLE WEATHERHEAD

ATTACH ANTENNA 40" BELOW POWER

ATTACH ANTENNA ALONG MAST ARM A MINIMUM OF 6 FEET AWAY FROM THE VERTICAL SHAFT MEMBER

NOTE: ATTACHMENT NOTES FOR THE ANTENNA CAN ALSO BE CHANGED TO REFERENCE OTHER UTILITIES (I.E., PHONE, CABLE, ETC.)
NOTE: FOR UNDERGROUND CONDUIT INSTALLATIONS INCLUDE THE FOLLOWING NOTE — "PROVIDE COAXIAL CABLE SUITABLE FOR WET LOCATIONS"

OTHER COMMONLY USED NOTES

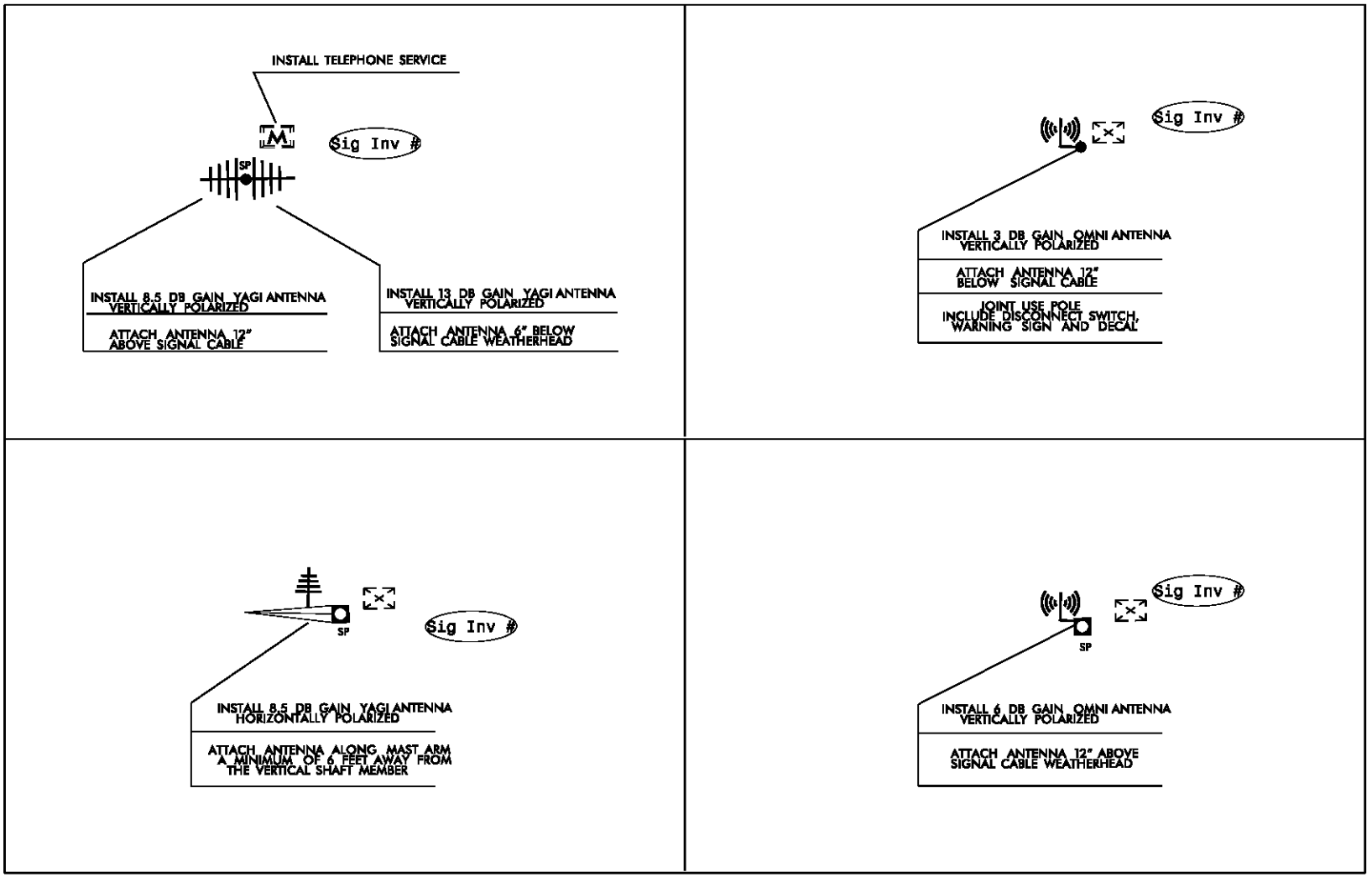
MASTER NOTE

INSTALL TELEPHONE SERVICE

JOINT USE POLE NOTE

JOINT USE POLE
INCLUDE DISCONNECT SWITCH, WARNING SIGN AND DECAL

SAMPLES



Wireless Communications – Sample Intersection with Wireless Notes

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
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ANTENNA DESIGN NOTES

OMNI ANTENNAS ARE ALWAYS INSTALLED VERTICALLY POLARIZED.

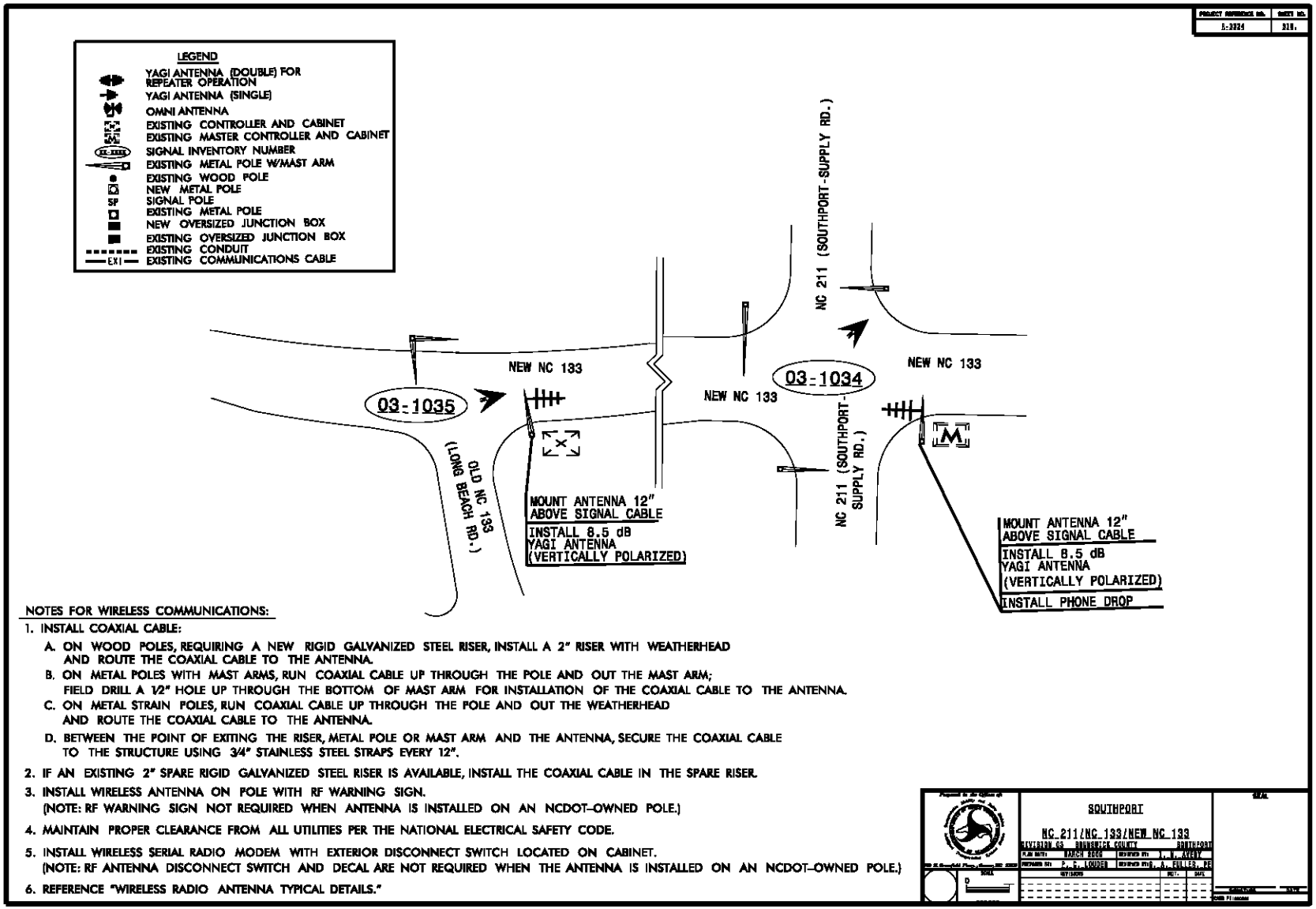
YAGI ANTENNAS CAN BE INSTALLED EITHER VERTICALLY POLARIZED OR HORIZONTALLY POLARIZED.

OMNI ANTENNAS CAN COMMUNICATE WITH BOTH OMNI ANTENNAS AND YAGI ANTENNAS. HOWEVER, IF COMMUNICATIONS IS DESIRED BETWEEN AN OMNI ANTENNA AND A YAGI ANTENNA, THEN THE YAGI ANTENNA MUST BE INSTALLED IN THE VERTICALLY POLARIZED POSITION.

YAGI ANTENNAS INSTALLED IN THE VERTICALLY POLARIZED POSITION CAN ONLY COMMUNICATE WITH OTHER YAGI ANTENNAS THAT ARE ALSO VERTICALLY POLARIZED.

YAGI ANTENNAS INSTALLED IN THE HORIZONTALLY POLARIZED POSITION CAN ONLY COMMUNICATE WITH OTHER YAGI ANTENNAS THAT ARE ALSO HORIZONTALLY POLARIZED.

WHEN DEALING WITH A DUAL ANTENNA DESIGN (REPEATING OPERATION) THE ANTENNAS CAN BOTH BE INSTALLED HORIZONTALLY POLARIZED OR VERTICALLY POLARIZED. ADDITIONALLY, ONE ANTENNA CAN BE INSTALLED HORIZONTALLY POLARIZED AND THE SECOND ANTENNA CAN BE INSTALLED VERTICALLY POLARIZED.



NOTES FOR WIRELESS COMMUNICATIONS:

1. INSTALL COAXIAL CABLE:
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3. INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN. (NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET. (NOTE: RF ANTENNA DISCONNECT SWITCH AND DECAL ARE NOT REQUIRED WHEN THE ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."

SOUTHPORT
NC 211/NC 133/NEW NC 133
DIVISION 03 BRUNSWICK COUNTY SOUTHPORT

Wireless Communications – Sample Plan – Wireless Communications Plan (Stand Alone)

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
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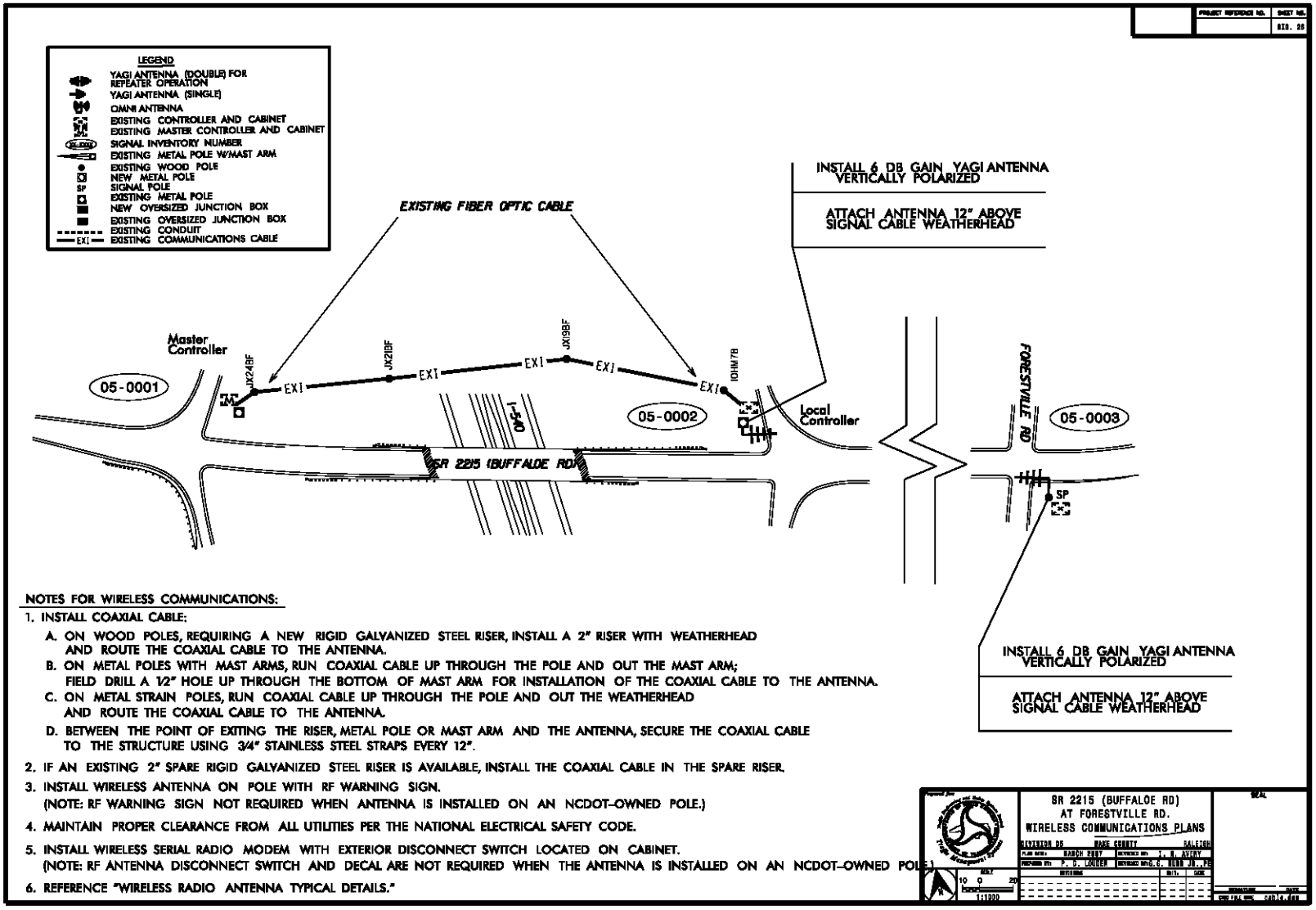

NOTES FOR WIRELESS COMMUNICATIONS:

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   - C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   - D. BETWEEN THE POINT OF EXITING THE RISER, METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
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6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."

SR 2215 (BUFFALOE RD)
AT FORESTVILLE RD.
WIRELESS COMMUNICATIONS PLANS

Wireless Communications – Sample Plans – Fiber (Local Intersection) to Wireless Intersection

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
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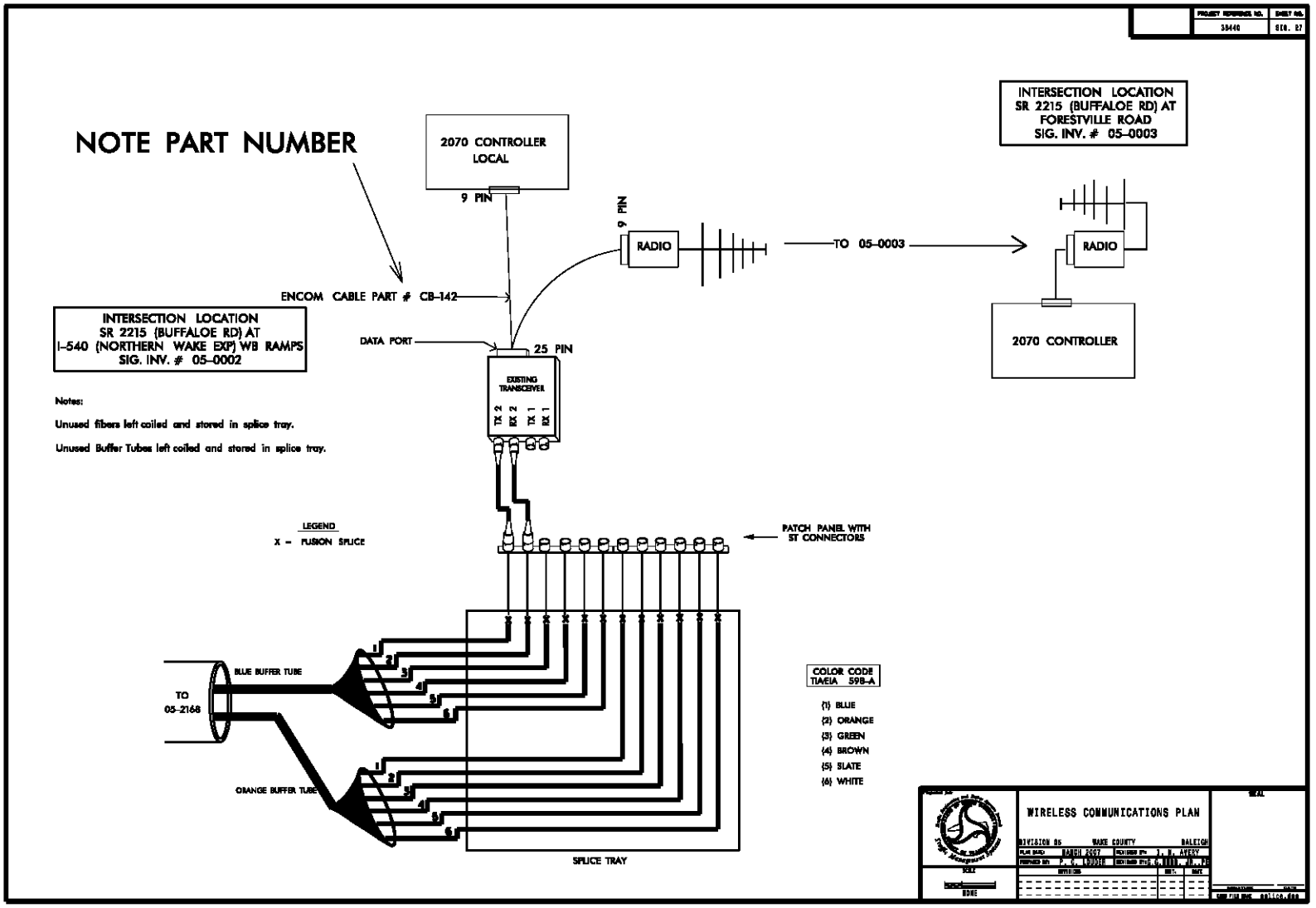

Wireless Communications – Sample Plans – Fiber Splicing (Local Intersction) to Wireless Intersection

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
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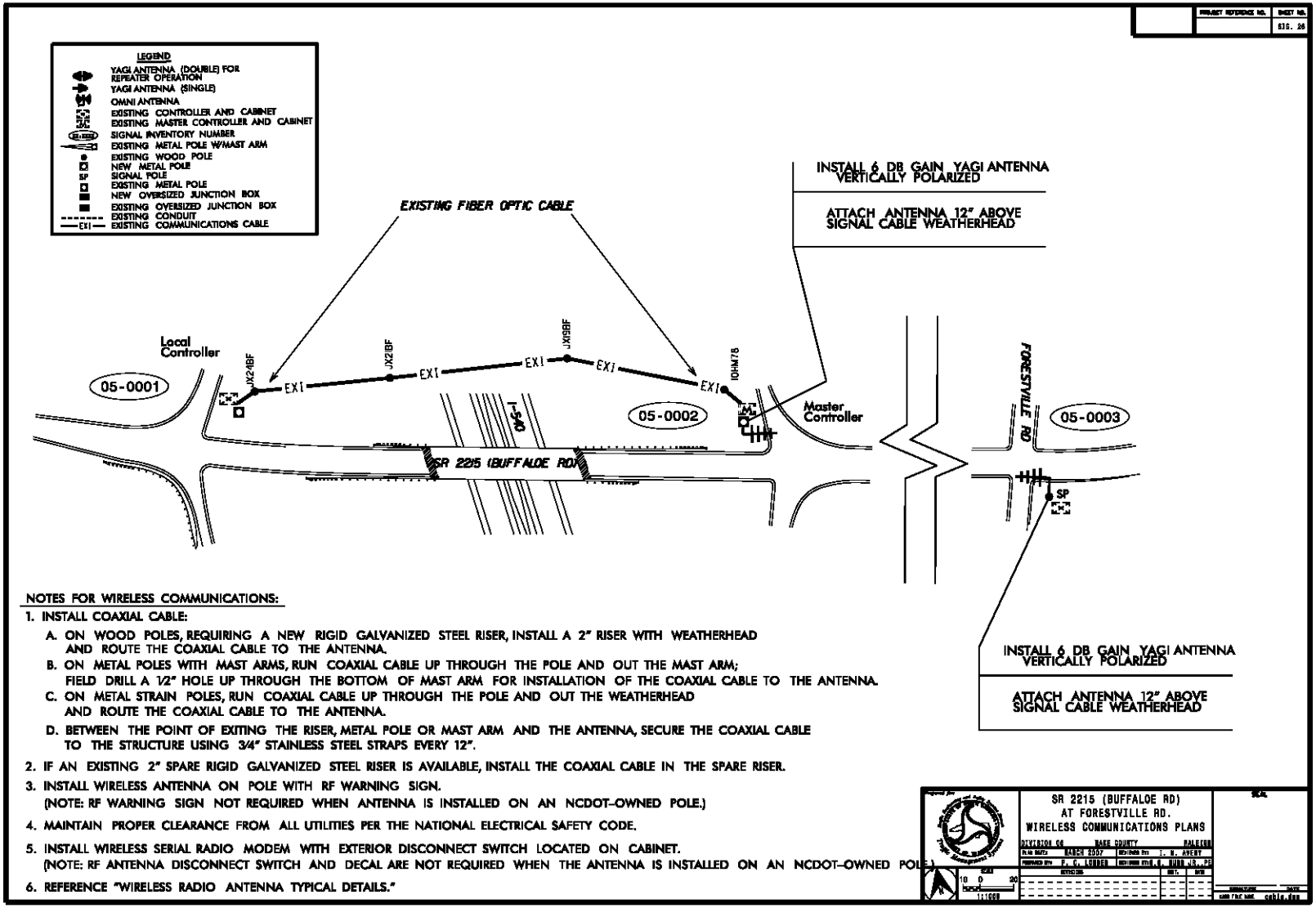

NOTES FOR WIRELESS COMMUNICATIONS:

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   - B. ON METAL POLES WITH MAST ARMS, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE MAST ARM; FIELD DRILL A 1/2" HOLE UP THROUGH THE BOTTOM OF MAST ARM FOR INSTALLATION OF THE COAXIAL CABLE TO THE ANTENNA.
   - C. ON METAL STRAIN POLES, RUN COAXIAL CABLE UP THROUGH THE POLE AND OUT THE WEATHERHEAD AND ROUTE THE COAXIAL CABLE TO THE ANTENNA.
   - D. BETWEEN THE POINT OF EXITING THE RISER, METAL POLE OR MAST ARM AND THE ANTENNA, SECURE THE COAXIAL CABLE TO THE STRUCTURE USING 3/4" STAINLESS STEEL STRAPS EVERY 12".
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3. INSTALL WIRELESS ANTENNA ON POLE WITH RF WARNING SIGN. (NOTE: RF WARNING SIGN NOT REQUIRED WHEN ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
4. MAINTAIN PROPER CLEARANCE FROM ALL UTILITIES PER THE NATIONAL ELECTRICAL SAFETY CODE.
5. INSTALL WIRELESS SERIAL RADIO MODEM WITH EXTERIOR DISCONNECT SWITCH LOCATED ON CABINET. (NOTE: RF ANTENNA DISCONNECT SWITCH AND DECAL ARE NOT REQUIRED WHEN THE ANTENNA IS INSTALLED ON AN NCDOT-OWNED POLE.)
6. REFERENCE "WIRELESS RADIO ANTENNA TYPICAL DETAILS."

SR 2215 (BUFFALOE RD)
AT FORESTVILLE RD.
WIRELESS COMMUNICATIONS PLANS

Wireless Communications – Sample Plans – Fiber (Local Intersection) to Wireless Intersection

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
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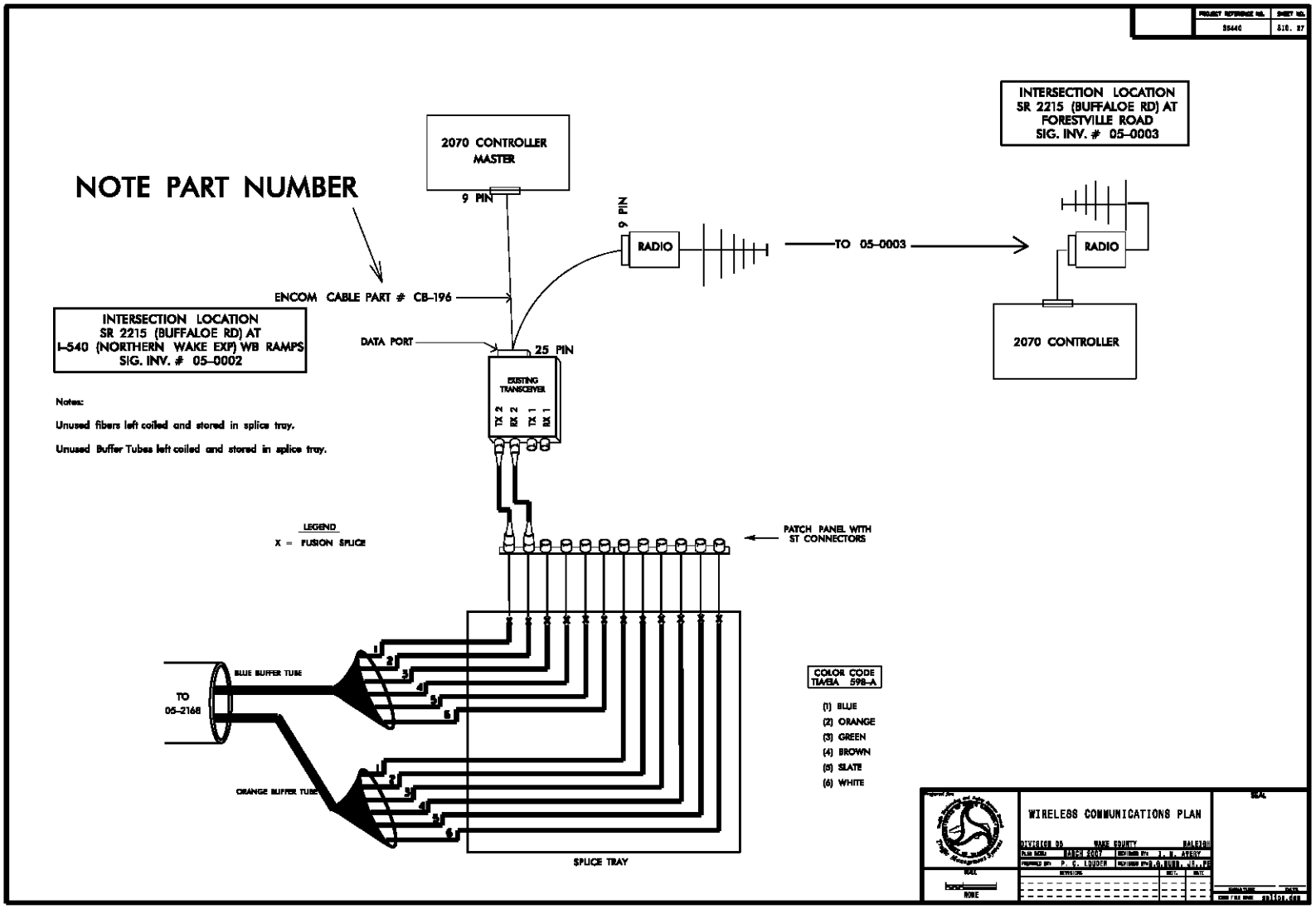

Wireless Communications – Sample Plans – Fiber Splicing (Master Intersction) to Wireless Intersection

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRANSPORTATION MOBILITY AND SAFETY DIVISION
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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DMS Site Selection and Design Process

- Obtain recommended locations from Congestion Management Section
- Identify points of interest:
  - Alternate route(s)
  - Venues (Stadiums, Motor Speedways, Sports /Concert Arenas)
- Set up a field investigation event with the following people:
  - Division Incident Management Engineer
  - Regional ITS Engineer
  - Regional Traffic Engineer
  - Signing Project Design Engineer
- Select a location that meets the following criteria:
  - Select location that is 2–4 miles in advance of the point of interest
  - Insure that display has at least 1200′ of unobstructed sight distance
  - Avoid placement in curves
  - Select location where shoulder is widest to avoid future lane closure
  - Ensure an ideal location at least 50 feet in advance of the display can be selected for the controller cabinet
  - Consider phone and power service availability
  - For 1–2 lanes (each direction) consider pedestal type assembly
  - For 3 or more lanes (each direction) consider full span assembly
  - Ensure all parties agree on the selected location
- Confirm the location by sending emails to all parties involved
  - Reference the location from the nearest mile marker
  - If no mile marker exists, use bridge or intersection as reference
- Confirm availability of utilities by coordinating with Division personnel and Utility agents
- Develop Project Special Provisions
  - Determine if a particular brand is to be specified
    - Ensure integration section and pay item is included
    - Ensure that a bench test unit is not required
    - Determine if training is required
    - Determine if UPS, Modem, and Modem Reset devices are needed
  - Determine if desktop /laptop computers are needed
  - Determine if software upgrade is required
  - Determine if Fiber Optic Communication is to be used
    - Determine if dial–up backup system is not required
      - Ensure that dial up modems and related devices are not required
- Follow up with the Signing Section on the development of Structure line drawings, Traffic Control, and Roadway Plans
- If assembling the package for submission to Design Services, obtain plans from Traffic Control and Roadway and confirm quantities
- Ensure DMS Grounding Detail is inserted into the ITS Plans
- Ensure DMS Project Special Provisions are included with ITS Package

Dynamic Message Signs – Site Selection & Design Process

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
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I. Cabinets

A. Note cabinet location

B. Note signal inventory number
(usually marked on cabinet)
Example: 01–0459

C. Note cabinet type
(base mount/pole mount)

D. Check inside cabinet for space conduit
(signal technician must be present before doing this)

II. Poles

A. Note pole type
(wood,metal,metal with mast arm)

B. Note pole number
(if applicable)
Use "SP" for signal pole

C. Determine NCDOT attachment height

D. Note any clearance problems or
adjustments required in order to
assume the desired attachment height

E. See section 1.0 for NESC clearance requirements

F. Record distances between poles
using laser range finder or measuring wheel

G. When evaluating adjustment options, be mindful
of 'height over grade' clearances

H. If adjustments are required on a pole,
record the attachment heights of all
existing utilities using the laser range finder

I. Determine vertical clearance over road as needed.
Use the laser range finder.
Measure from the roadway to the lowest
point on the span.

III. Roads and Structures

A. Record all road names and
state road (SR) numbers if applicable

B. Note any bridges (grade separations)

C. Record any landmarks, buildings, or
other structures for reference purposes
as needed

IV. Railroads

A. When the cable route crosses over
or under a railroad, special wire–line
agreements must be made.

B. The following information is needed
for wire line agreements:

1. Crossing number (if available)
usually found on cross arm mechanism
or crossing controller cabinet

2. Distance from center line of track to the
nearest pole on each side of the track
(for aerial installation)

3. Vertical clearance from the top of the rail
to the lowest existing overhead utility
(aerial installation)

4. Distance from crossing to the nearest
railway mile marker.
This information may be obtained through
NCDOT Railway Division, Railroad Company
Right of Way, or NCDOT Right of Way.

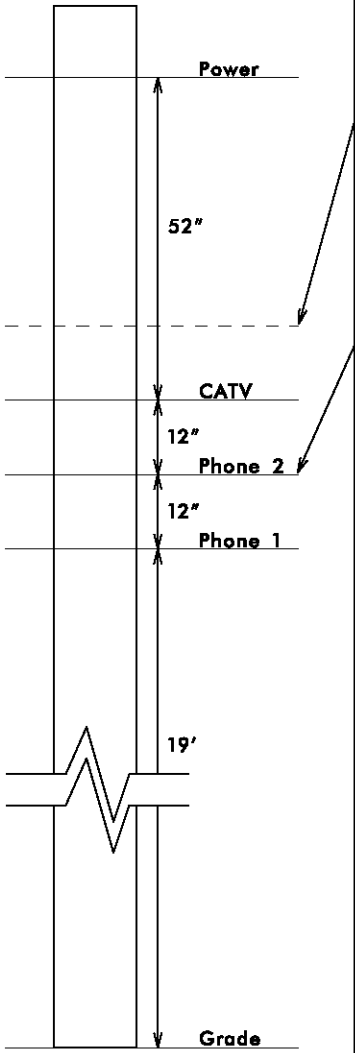
Utility Make Ready – Field Investigation Checklist

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
8.0
SHEET 1 OF 1

Case 1



A. If proposed NCDOT communications cable attachment height is 40" below power

Typical Adjustment Notes

no adjustment required

there is adequate clearance

B. If proposed NCDOT communications cable attachment height is 12" below CATV

Typical Adjustment Notes

CATV raise to 40" below power

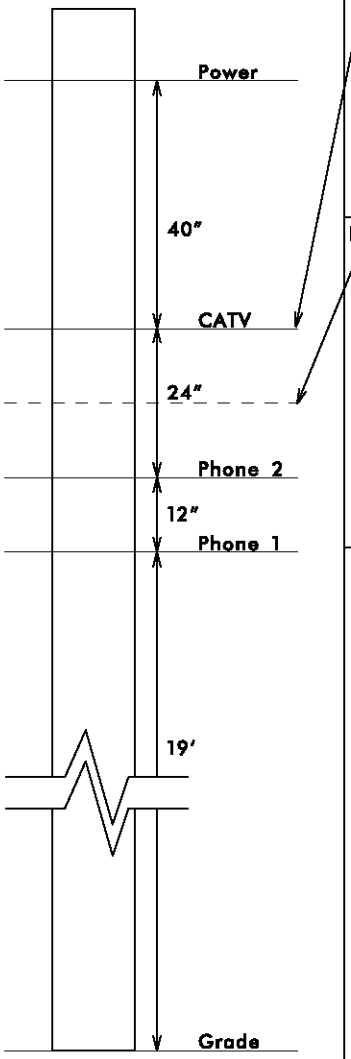
or

phone 2 lower to 24" below CATV
phone 1 lower to 12" below phone 2

Typical Utility Tree

25' -04"	Power	
21' -00"	CATV	52"
20' -00"	Phone 2	12"
19' -00"	Phone 1	12"

Case 2



A. If proposed NCDOT communications cable attachment height is 40" below power

Typical Adjustment Notes

CATV lower to 52" below power

B. If proposed NCDOT communications cable attachment height is 12" below CATV

Typical Adjustment Notes

no adjustment note required

there is adequate clearance

Typical Utility Tree

25' -04"	Power	
22' -00"	CATV	40"
20' -00"	Phone 2	24"
19' -00"	Phone 1	12"

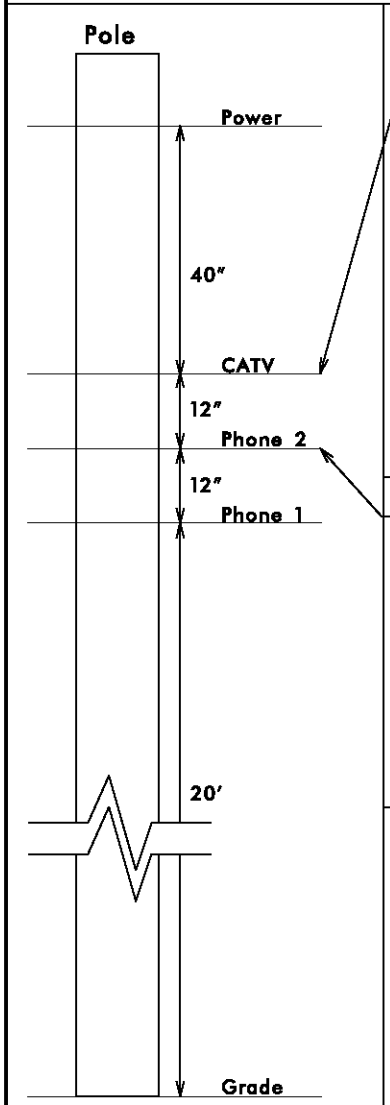
Utility Make Ready – Common Adjustment Notes

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
8.1
SHEET 1 OF 2

Case 3



A.

If proposed NCDOT communications cable attachment height is 40″ below power

Typical Adjustment Notes

All utilities to lower 12″

or

CATV lower to 52″ below power
Phone 2 lower to 64″ below power
Phone 1 lower to 76″ below power

or

CATV lower to 52″ below power
Phone 2 lower to 12″ below CATV
Phone 1 lower to 12″ below Phone 2

B.

If proposed NCDOT communications cable attachment height is 12″ below CATV

Typical Adjustment Notes

Phone 1 and Phone 2 lower 12″

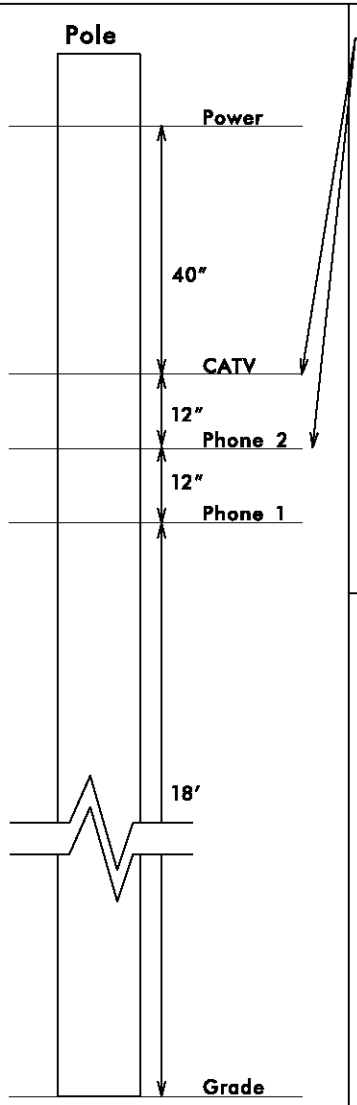
or

Phone 2 lower to 24″ below CATV
Phone 1 lower to 12″ below Phone 2

Typical Utility Tree

25′ -04"	Power	
22′ -00"	CATV	40"
21′ -00"	Phone 2	12"
20′ -00"	Phone 1	12"

Case 4



If proposed NCDOT communications cable attachment height is
40″ below power
or
12″ below CATV

Required adjustments would put lowest utility (phone 1) below 18′ above grade

Therefore the existing pole must be replaced with a taller pole

Typical Adjustment Notes

General

Change out pole

Specific

Replace existing power pole (pole #) with class 2 – 55′ wood pole

Typical Utility Tree

23′ -04"	Power	
20′ -00"	CATV	40"
19′ -00"	Phone 2	12"
18′ -00"	Phone 1	12"

Utility Make Ready – Common Adjustment Notes

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
8.1
SHEET 2 OF 2

Standard Design Elements Feature Description	Level	Color	Line Wt.	Line Style
Existing Roads EOP	58150	4	4	0
Existing Roads Match Line	58151	3	4	0
Proposed Aerial Guy	58152	6	1	0
Existing Bridge	58153	6	3	0
Existing Sidewalk	58154	19	1	0
Proposed Construction Note Leader Line	58155	3	1	0
Proposed Attachment Note Leader Line	58156	3	1	0
Proposed Utility Adjustment Leader Line	58157	3	1	0

Text Feature Description	Level	Color	Line Wt.	Line Style	Font	Size (English) 30:1	40:1	50:1	60:1	70:1	80:1	90:1	100:1
Existing Road Text	58200	3	4	0	11	8	10	12	14	16	18	20	22
Existing Road Match Line Text	58201	13	4	0	11	8	10	12	14	16	18	20	22
Existing Sidewalk Text	58202	19	1	0	11	4	5	7	9	11	13	15	17
Proposed Slack Span Text	58203	3	1	0	11	4	5	7	9	11	13	15	17
Proposed Attachment Text	58204	3	1	0	11	6	8	10	12	14	16	18	20
Proposed Utility Adjustment Text	58205	3	1	0	11	8	10	12	14	16	18	20	22
Existing Railroad Text	58206	7	1	0	11	8	10	12	14	16	18	20	22
Existing Right of Way Text	58207	5	1	0	11	8	10	12	14	16	18	20	22
Existing Pole Text	58208	3	1	0	11	4	5	7	9	11	13	15	17
Proposed General Note Text	58209	3	1	0	11	8	10	12	14	16	18	20	22

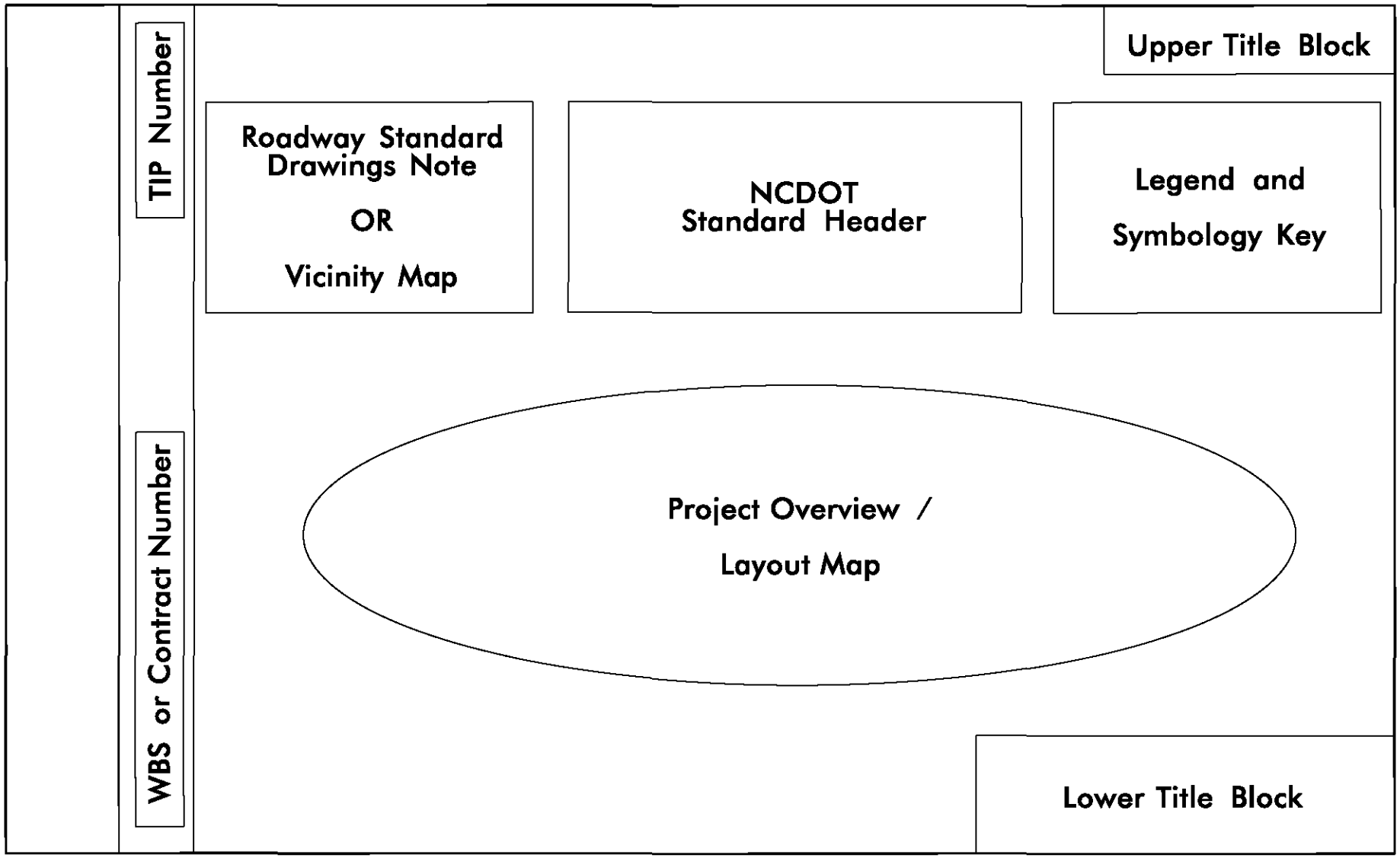
	Custom Line Styles Feature Description	Level	Color	Line Wt.	Line Style	Font	Scale 30:1	40:1	50:1	60:1	70:1	80:1	90:1	100:1
TMS Custom	Proposed Aerial Fiber Optic Cable	58000	3	0	Sig Com Cab FO		70	80	90	100	120	140	160	180
TMS Custom	Proposed Twisted Pair Cable	58001	4	0	Sig Com Cab Twi Pr Exi		70	80	90	100	120	140	160	180
TMS Custom	Existing Communications Cable	58002	1	0	Sig Com Cab Exi		70	80	90	100	120	140	160	180
TMS Custom	Remove Existing Communications Cable	58003	2	0	Sig Com Cab Rmv		70	80	90	100	120	140	160	180
TMS Custom	Proposed Conduit	58004	0	0	Sig Com Cab Nw Cond		70	80	90	100	120	140	160	180
TMS Custom	Existing Conduit	58005	6	0	Sig Com Cab Exi Cond		70	80	90	100	120	140	160	180
TMS Custom	Proposed Directional Drilled Conduit	58006	1	0	Sig Com Cab Dr Dri		70	80	90	100	120	140	160	180
TMS Custom	Proposed Jack and Bore Conduit	58007	120	0	Sig Com Cab Jac Bor		70	80	90	100	120	140	160	180
Other Custom	Existing Railroad Track	58008	7	2	(0) ncmap RR Gau Std		70	80	90	100	120	140	160	180
Other Custom	Existing Railroad Track (Title Sheet)	58009	0	1	(0) Sig Geo RR		1	1.5	2	2	2.5	2.5	3	3
Other Custom	Existing Railroad Gate	58010	3	1	(0) Sig Geo RR Gat		1	1.5	2	2	2.5	2.5	3	3
Other Custom	Existing Railroad Cantilever	58011	3	1	(0) Sig Geo RR Can		1	1.5	2	2	2.5	2.5	3	3
Other Custom	Existing Railroad Lights	58012	3	1	(0) Sig Geo RR Lit		1	1.5	2	2	2.5	2.5	3	3
Other Custom	Existing Right of Way	58013	5	1	(0) ncmap ROW Exi		30	40	50	60	70	80	90	100
Other Custom	Existing Guard Rail	58014	6	4	(0) Rdy GR Prop		30	40	50	60	70	80	90	100
Other Custom	Existing Fence Line	58015	0	1	(0) ncmap Fen		30	40	50	60	70	80	90	100
Other Custom	Existing Hedge Row	58016	153	1	(0) ncmap Hdg		30	40	50	60	70	80	90	100
Other Custom	Existing Woods	58017	153	1	(0) ncmap Wds		30	40	50	60	70	80	90	100
Other Custom	Existing Streams and Rivers	58018	99	1	2-5-2		1	1	1	1	1	1	1	1

Standard Sheet Layout – TMS Standard CADD Symbology

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
9.0
SHEET 1 OF 1



Standard Sheet Layout – UMR Title Sheet

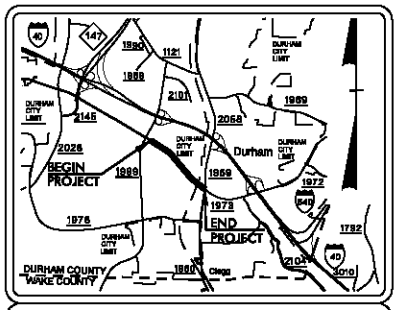
INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
9.1
SHEET 1 OF 5

R-2904

WBS: 34512



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

DURHAM COUNTY

LOCATION: NC 54 FROM SR 1999 (DAVIS DRIVE) TO SR 1959 (MIAMI BOULEVARD)

TYPE OF WORK: UTILITY MAKE READY

PROJECT REFERENCE NO.	SHEET NO.
R-2904	U/MR. 0

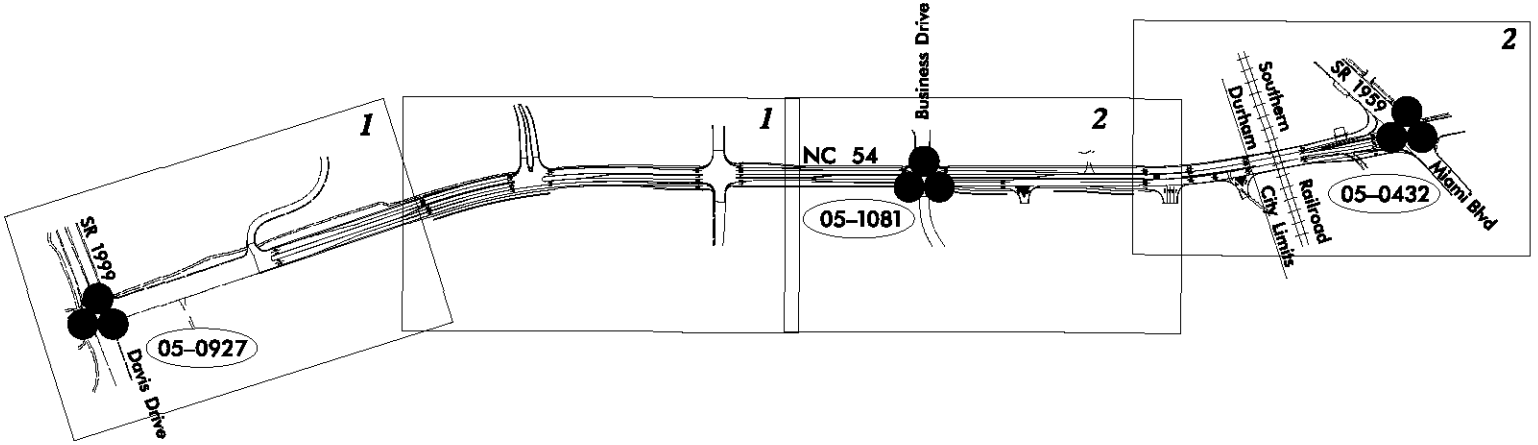
LEGEND

- FO — NEW FIBER OPTIC COMMUNICATIONS CABLE
- EX — EXISTING COMMUNICATIONS CABLE
- NEW CONDUIT
- EXISTING CONDUIT
- DD — NEW DIRECTIONAL DRILLED CONDUIT
- NEW JUNCTION BOX
- EXISTING JUNCTION BOX
- NEW WOOD POLE
- EXISTING WOOD POLE
- NEW METAL POLE
- EXISTING METAL POLE
- EXISTING CONTROLLER AND CABINET
- SP — SIGNAL POLE
- XX-XXXX — SIGNAL INVENTORY NUMBER
- SIGNALIZED INTERSECTION

POLE INVENTORY SYMBOLOGY

ATTACHMENT HEIGHT	EXISTING UTILITY
XX' - XX"	POWER
XX' - XX"	XXXXX
XX' - XX"	XXXXX
XX' - XX"	XXXXX
XX' - XX"	XXXXX
XX' - XX"	XXXXX
XX' - XX"	XXXXX

SEPARATION



Utility Make Ready Plans

REVISIONS 05 DURHAM COUNTY DURHAM

PLAN DATE: JANUARY 2004 REVIEWED BY: I. M. AVERY

PREPARED BY: J. HOOKER REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

SIGNATURE DATE

CADD FILENAME

Standard Sheet Layout – Sample UMR Title Sheet

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
9.1

Notes

Number UMR plan sheets in the upper title block

Utility Make Ready plans are not sealed by a professional engineer do not include seal in lower block

PROJECT REFERENCE NO.	SHEET NO.
R-2904	UMR 0

Typical Upper Title Block

Typical Lower Title Block

Prepared in the Offices of:

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION · Traffic Engineering and Safety Systems Branch · Traffic Management Systems

122 N. McDowell St., Raleigh, NC 27603

SCALE 0

Utility Make Ready Plans

DIVISION 05 DURHAM COUNTY DURHAM

PLAN DATE: JANUARY 2004 REVIEWED BY: I. N. AVERY

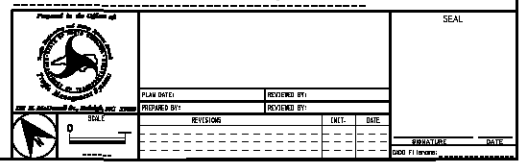
PREPARED BY: J. HOOKER REVIEWED BY:

REVISIONS	INIT.	DATE

SEAL

SIGNATURE DATE

CADD Filename:

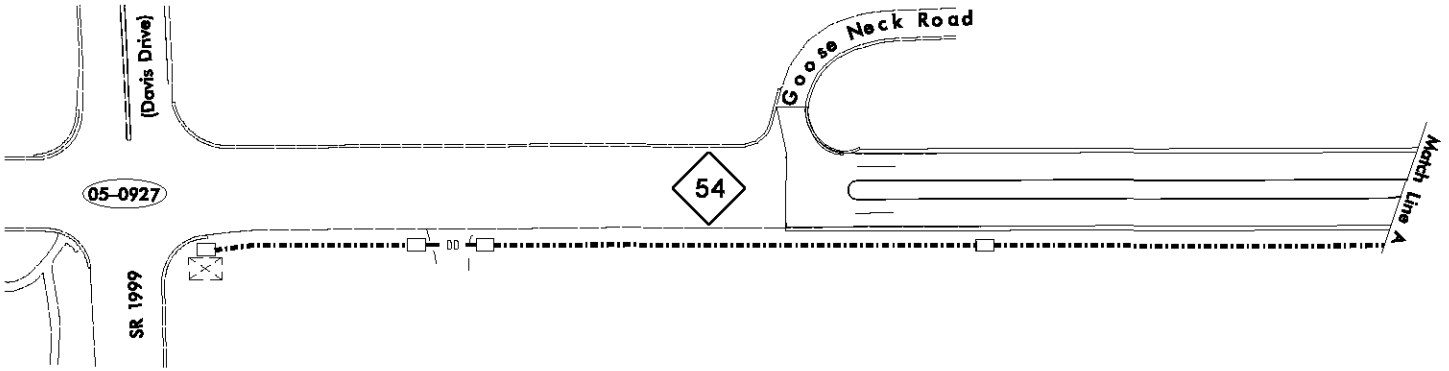


Standard Sheet Layout – Title Blocks – UMR

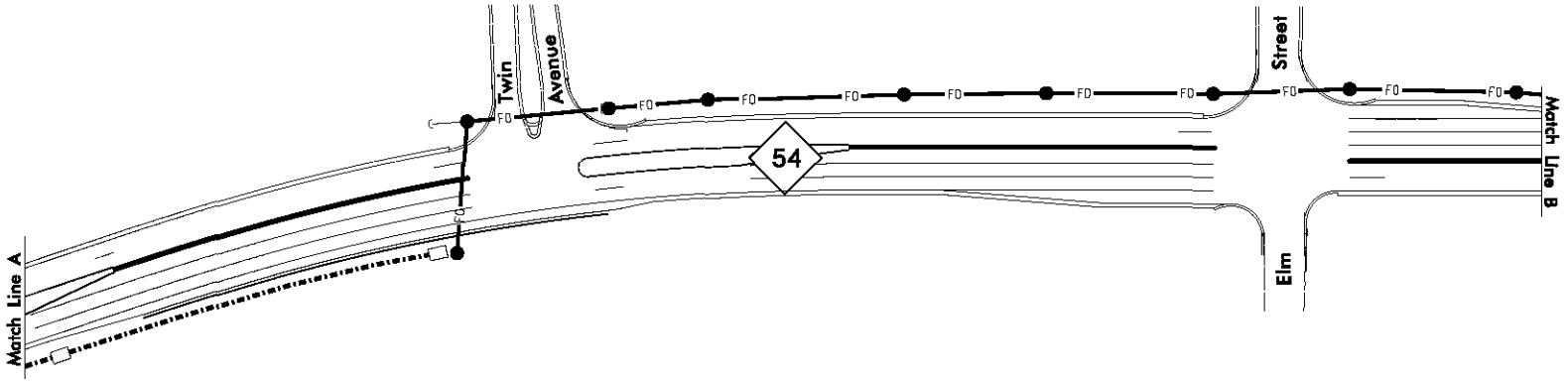
INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO. 9.1



No Utility Make Ready Work Required This Sheet



Utility Make Ready Plans

DIVISION 05 DURHAM COUNTY DURHAM

PLAN DATE: JANUARY 2004 REVIEWED BY: I. N. AVERY

PREPARED BY: J. HOOKER REVIEWED BY:

REVISIONS | INIT. | DATE

SCALE: 0

SEAL

SIGNATURE DATE

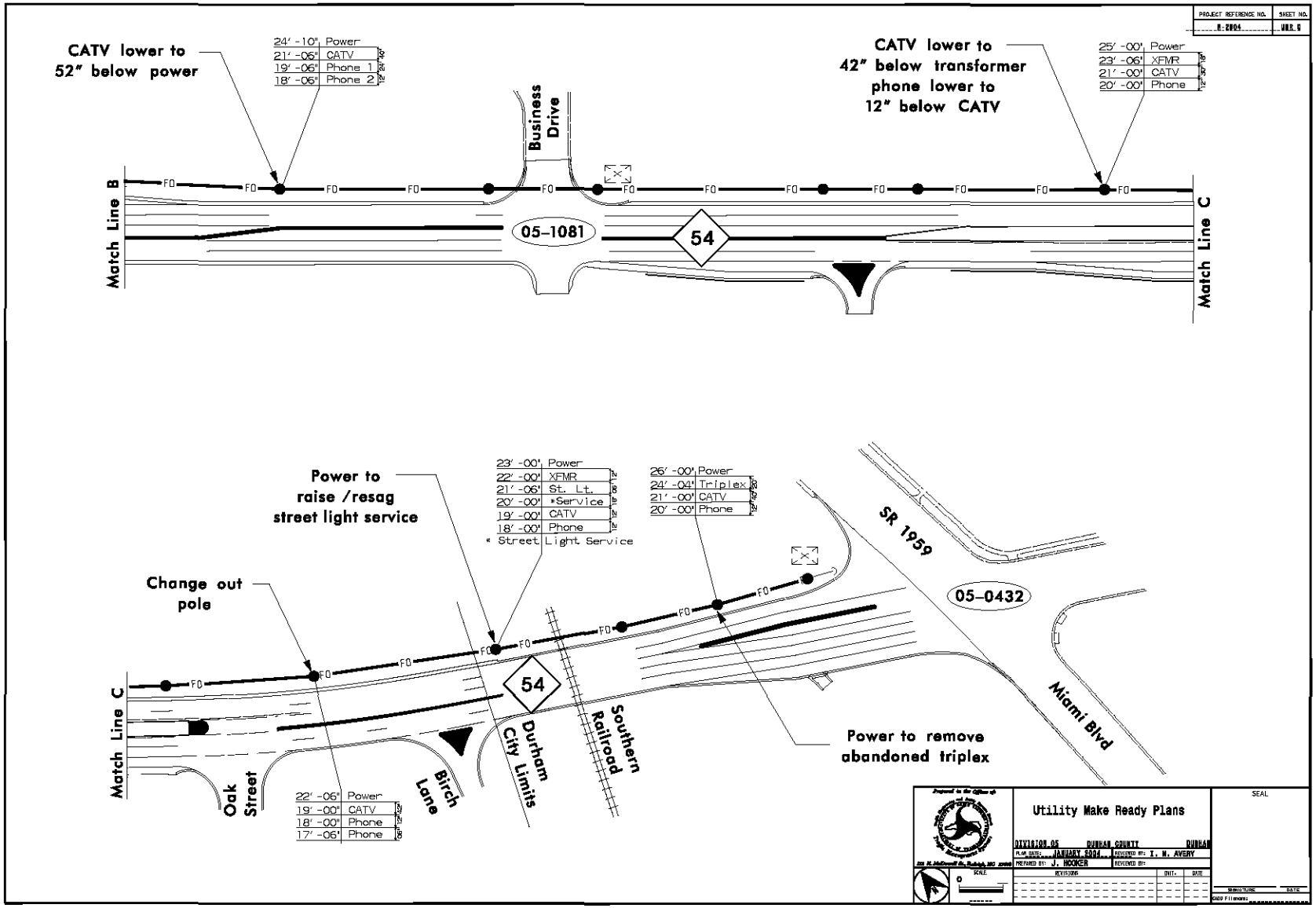
GOOD THROUGH

Standard Sheet Layout – Sample UMR Plan Sheet

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
9.1

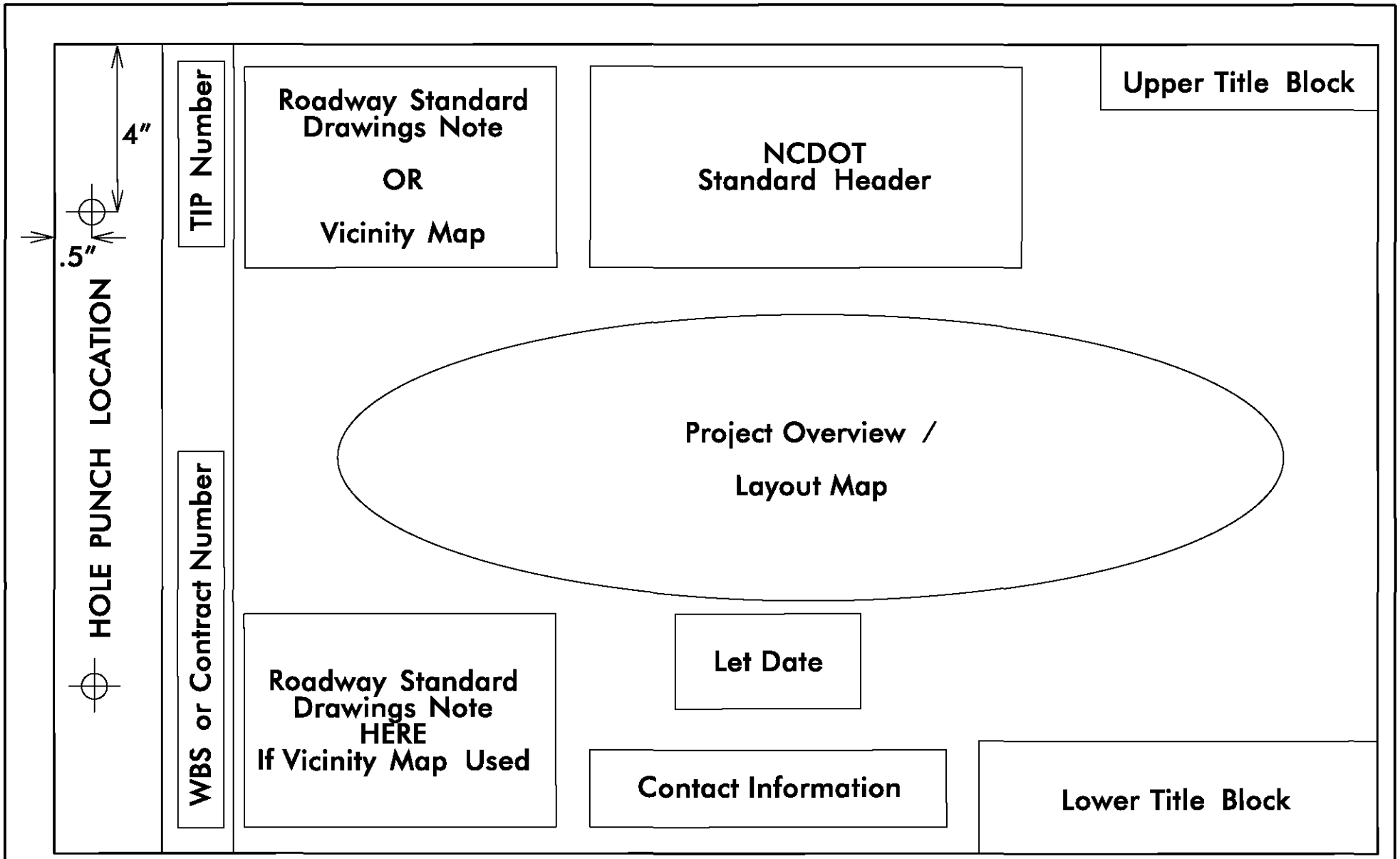


Standard Sheet Layout – Sample UMR Plan Sheet

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
9.1
SHEET 5 OF 5



Standard Sheet Layout – Cable Routing Title Sheet

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

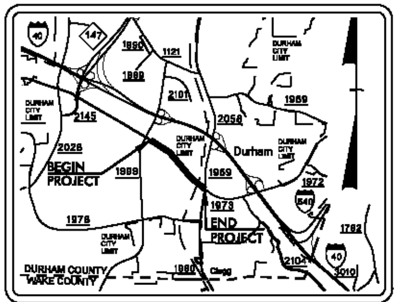
7-04

STD. NO.
9.2
SHEET 1 OF 5

PROJECT REFERENCE NO.	SHEET NO.
R-2904	TSS.1

R-2904

WBS: 34512



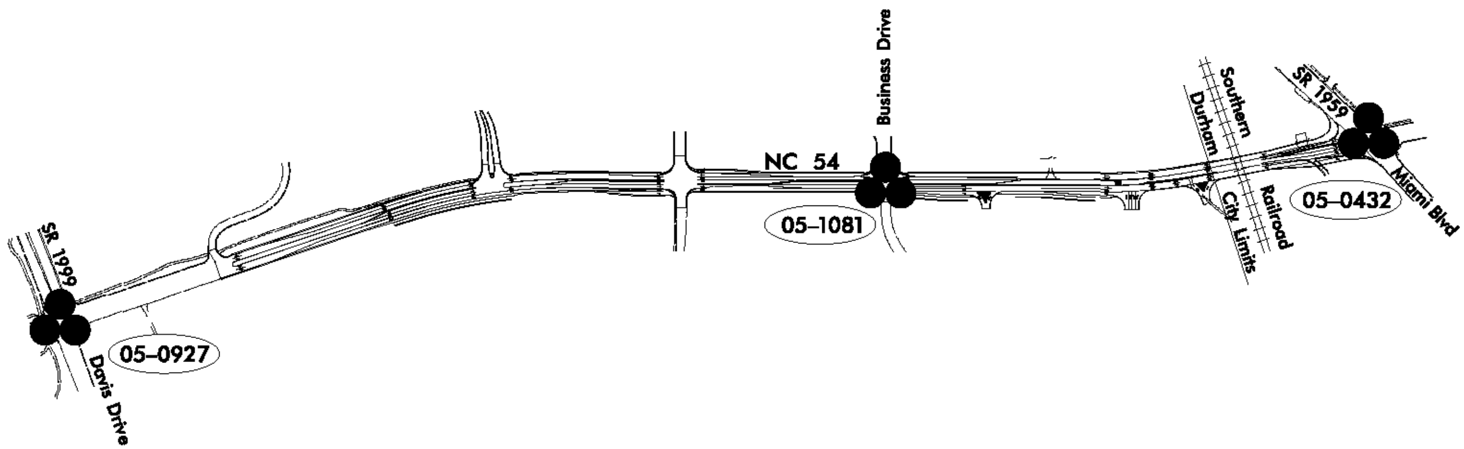
VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

DURHAM COUNTY

LOCATION: NC 54 FROM SR 1999 (DAVIS DRIVE) TO SR 1959 (MIAMI BOULEVARD)

TYPE OF WORK: COMMUNICATIONS CABLE AND CONDUIT ROUTING



ROADWAY STANDARD DRAWINGS

THE FOLLOWING ROADWAY STANDARDS AS APPEAR IN "ROADWAY STANDARD DRAWINGS", ROADWAY DESIGN UNIT – N.C. DEPARTMENT OF TRANSPORTATION – RALEIGH, N.C., DATED JANUARY 2002 ARE APPLICABLE TO THIS PROJECT AND BY REFERENCE HEREBY ARE CONSIDERED A PART OF THESE PLANS:

STD. NO.	TITLE
1715.01	UNDERGROUND CONDUIT
1716.01	JUNCTION BOXES
1720.01	WOOD POLES
1721.01	GUY ASSEMBLIES
1730.01	FIBER OPTIC CABLE – SPARE CABLE STORAGE
1730.02	FIBER OPTIC CABLE – CONDUIT INSTALLATION
1733.01	DELINEATOR MARKERS
1740.01	METAL POLES

Let Date: 12/14/04

NCDOT CONTACT:

TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
G.G. MURR, JR., PE – TRAFFIC MANAGEMENT SYSTEMS ENGINEER

Prepared in the Offices of:

Communications Cable and Conduit Routing Plans

DIVISION 05	DURHAM COUNTY	DURHAM
PLAN DATE: JANUARY 2004	REVIEWED BY: I. M. AVERY	
PREPARED BY: J. HOOKER	REVIEWED BY: J.Q. ENGINEER	

SCALE	REVISIONS	INIT.	DATE
0			

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 00000 ENGINEER JOHN Q. ENGINEER

SIGNATURE DATE

CADD Filename:

Standard Sheet Layout – Sample Cable Routing Title Sheet

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Notes

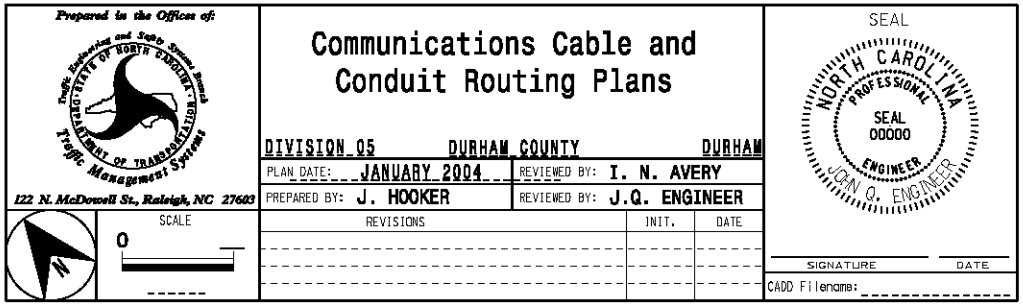
Number Cable Routing plan sheets in the upper title block

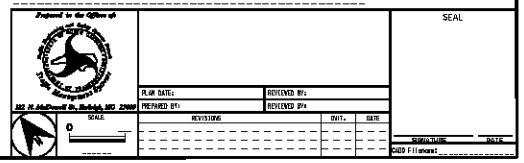
For Closed Loop System projects do not number the sheets. They are numbered later as part of a larger plan package.

PROJECT REFERENCE NO.	SHEET NO.
R-2904	TMS 1

Typical Upper Title Block

Typical Lower Title Block



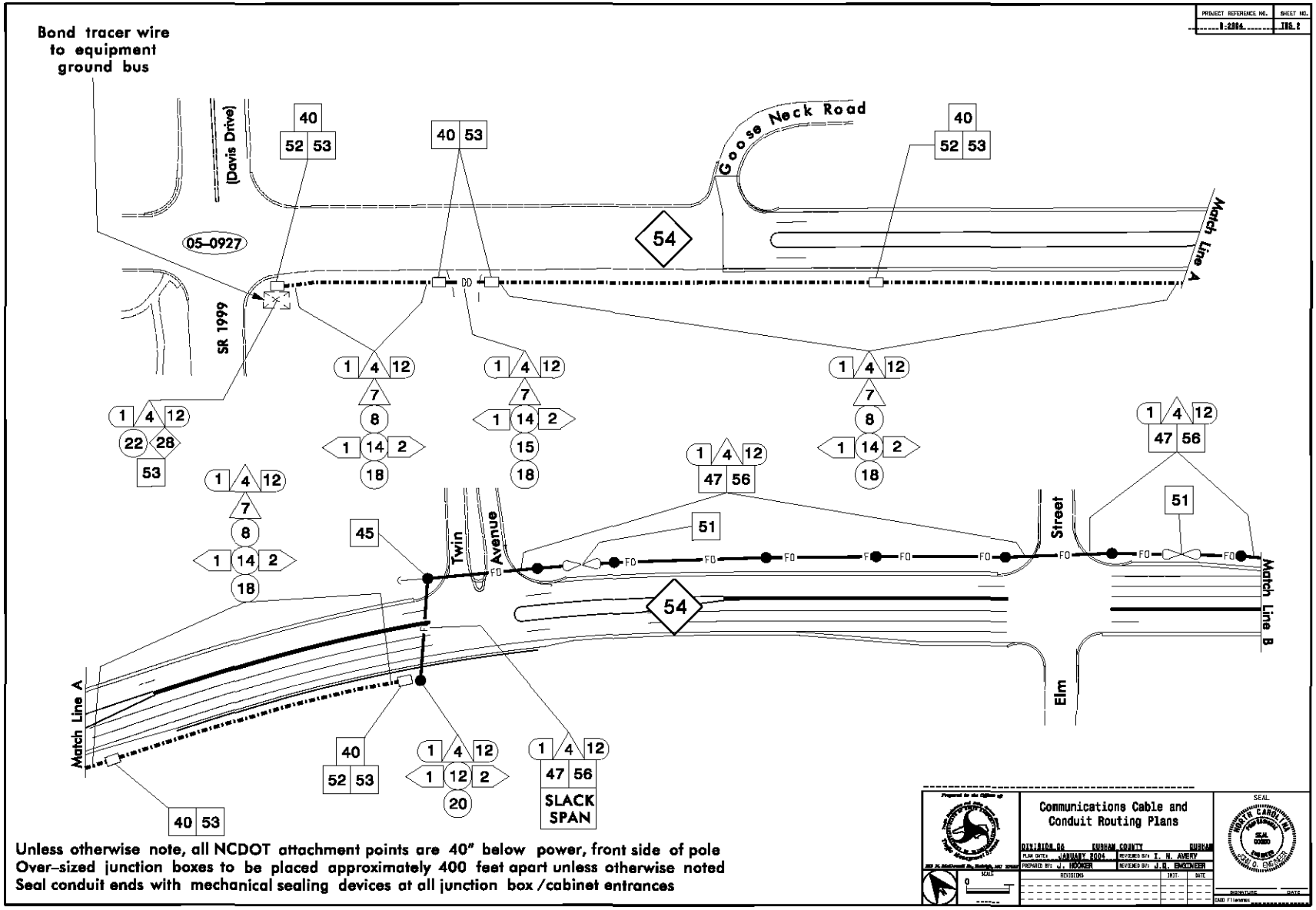


Standard Sheet Layout – Title Blocks – Cable Routing

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO. 9.2



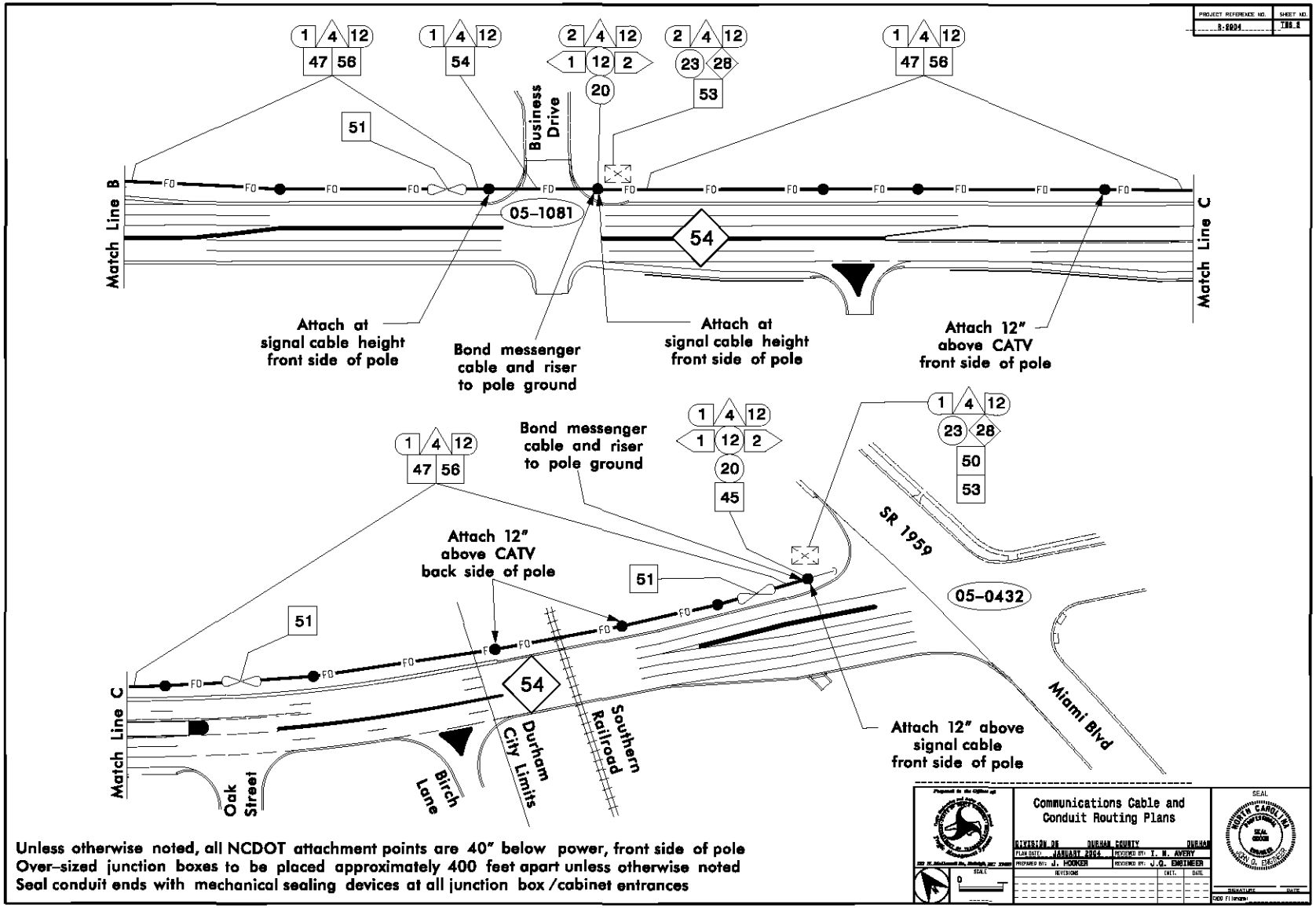
Unless otherwise note, all NCDOT attachment points are 40" below power, front side of pole
Over-sized junction boxes to be placed approximately 400 feet apart unless otherwise noted
Seal conduit ends with mechanical sealing devices at all junction box /cabinet entrances

Standard Sheet Layout – Sample Cable Routing Plan Sheet

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
9.2
SHEET 4 OF 5



Unless otherwise noted, all NCDOT attachment points are 40" below power, front side of pole
Over-sized junction boxes to be placed approximately 400 feet apart unless otherwise noted
Seal conduit ends with mechanical sealing devices at all junction box /cabinet entrances

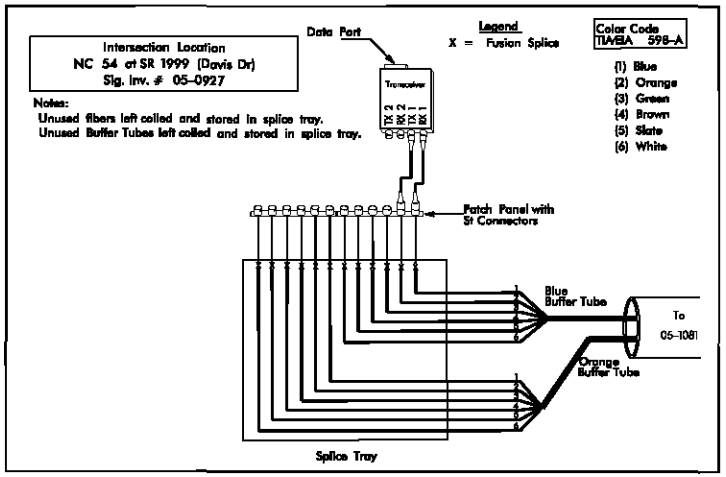
Standard Sheet Layout – Sample Cable Routing Plan Sheet

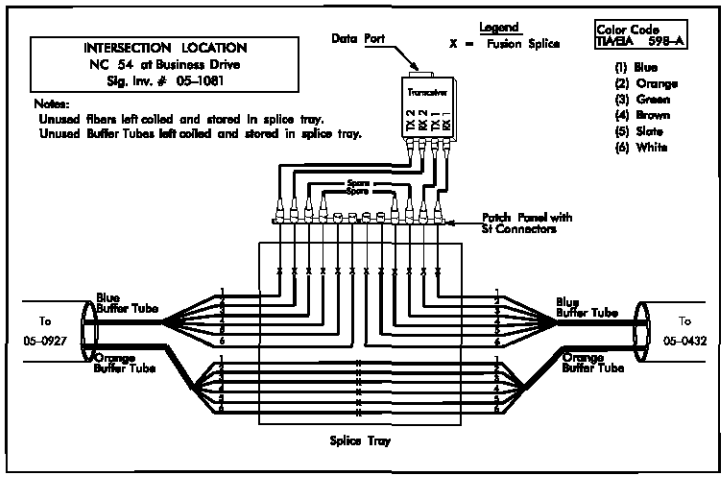
INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

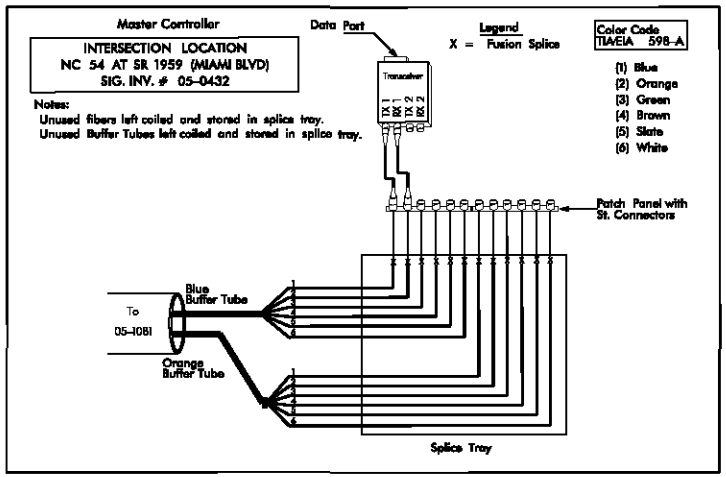
7-04

STD. NO.
9.2
SHEET 5 OF 5

Fiber Optic Cable







Transceiver termination configurations are generic. Contractor is responsible for determining \ ensuring proper terminations

PROJECT REFERENCE NO. B-2994 | SHEET NO. R18.

Splice Detail

DIVISION 06 DURHAM COUNTY DURHAM
PLAN DATE: JANUARY 2004 REVIEWED BY: I. N. AVERY
PREPARED BY: J. HOOKER REVIEWED BY: J.Q. ENGINEER
SCALE: 0
REVISIONS | INIT. | DATE

SEAL
NORTH CAROLINA
SEAL 00000
JOHN Q. ENGINEER

SIGNATURE DATE
CADD FILEname:

Standard Sheet Layout – Splice Plan

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
9.3
SHEET 1 OF 2

Fiber Optic Cable

PROJECT REFERENCE NO.	SHEET NO.
U-2904	STD.

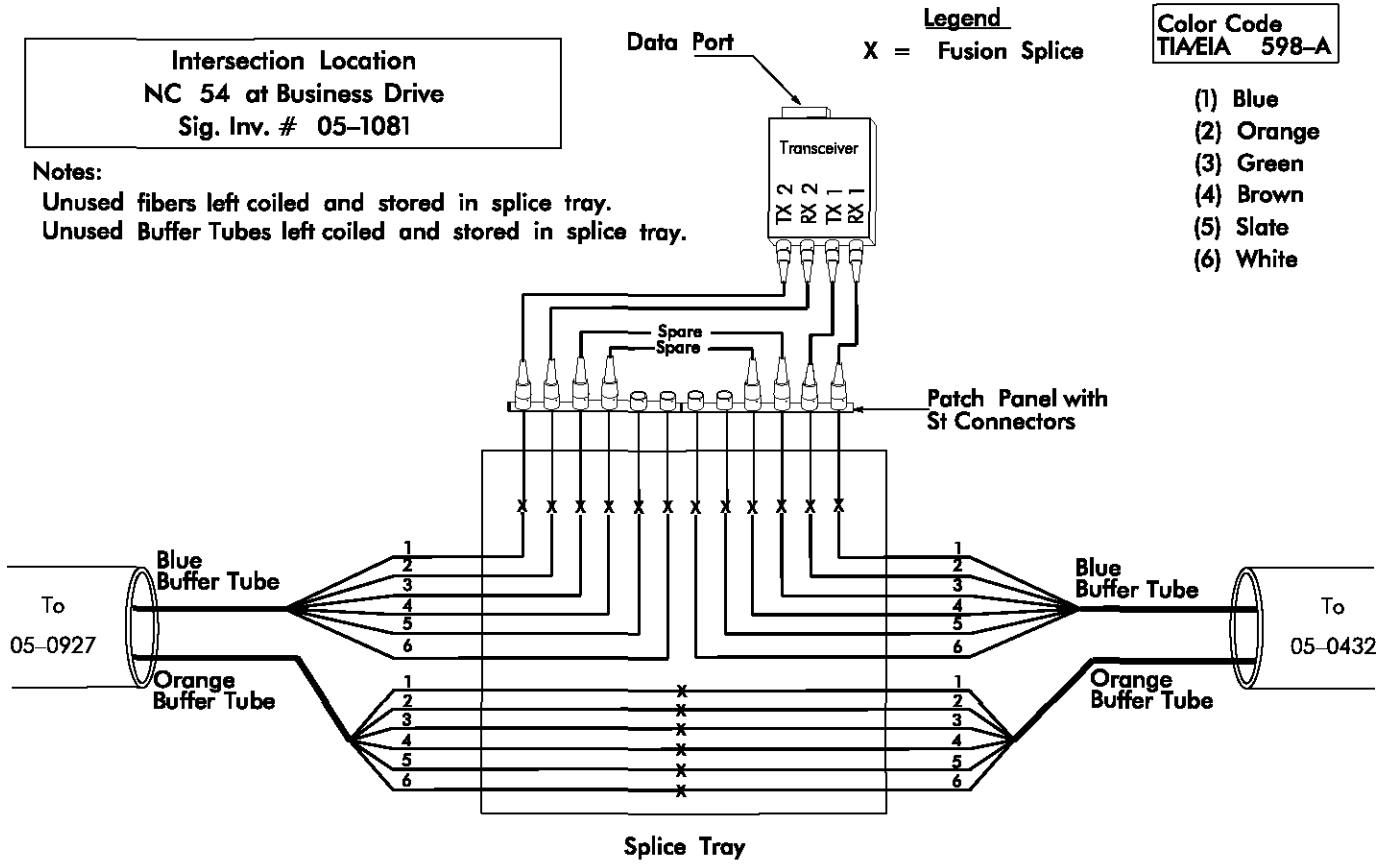
Intersection Location
NC 54 at Business Drive
Sig. Inv. # 05–1081

Notes:
Unused fibers left coiled and stored in splice tray.
Unused Buffer Tubes left coiled and stored in splice tray.

Legend
X = Fusion Splice

Color Code
TIA/EIA 598–A

(1) Blue
(2) Orange
(3) Green
(4) Brown
(5) Slate
(6) White



Transceiver termination configurations are generic. Contractor is responsible for determining \ ensuring proper terminations

Splice Detail

DIVISION 05 DURHAM COUNTY DURHAM
PLAN DATE: JANUARY 2004 REVISED BY: T. M. AVERY
PREPARED BY: J. HOOKER REVISED BY: J.D. ENGINEER

REVISIONS | INIT. | DATE

SEAL
NORTH CAROLINA
PROFESSIONAL ENGINEER
SEAL 00000
JOHN D. ENGINEER

SIGNATURE DATE

DGN File name:

Standard Sheet Layout – Splice Plan – Exploded View

INTELLIGENT TRANSPORTATION SYSTEMS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

7-04

STD. NO.
9.3
SHEET 2 OF 2