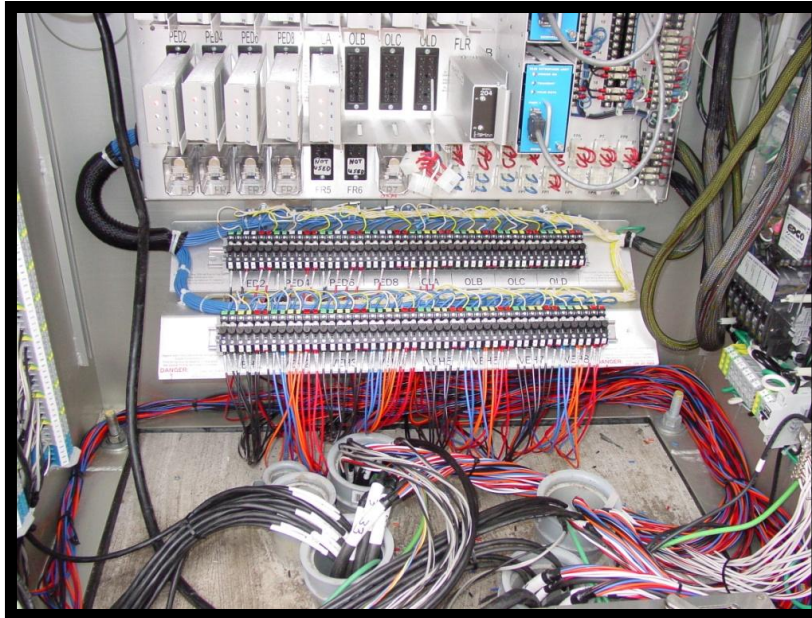


WIRING



The installation of all electrical cables and conductors must conform to the National Electrical Code. The Code represents the minimum required standard. Mn/DOT's requirements may exceed those of the Code.

All the material used in signal & lighting construction, including electrical wires, must be inspected and approved before it is installed. It is the Contractor's responsibility to provide the appropriate wire for the project. It is the inspector's responsibility to check the wire and record the information on the Materials Inspection Form. A copy of the Form is in the back of this manual.

Electrical cables and conductors must be as specified in the Contract documents.

All electrical cable (except as otherwise indicated in the Contract documents) must be listed by a National Recognized Testing Laboratory (NRTL) as defined by the U.S. Department of Labor. The testing laboratory must be listed by OSHA in its scope of recognition for the applicable tests being conducted as required by the Contract documents.

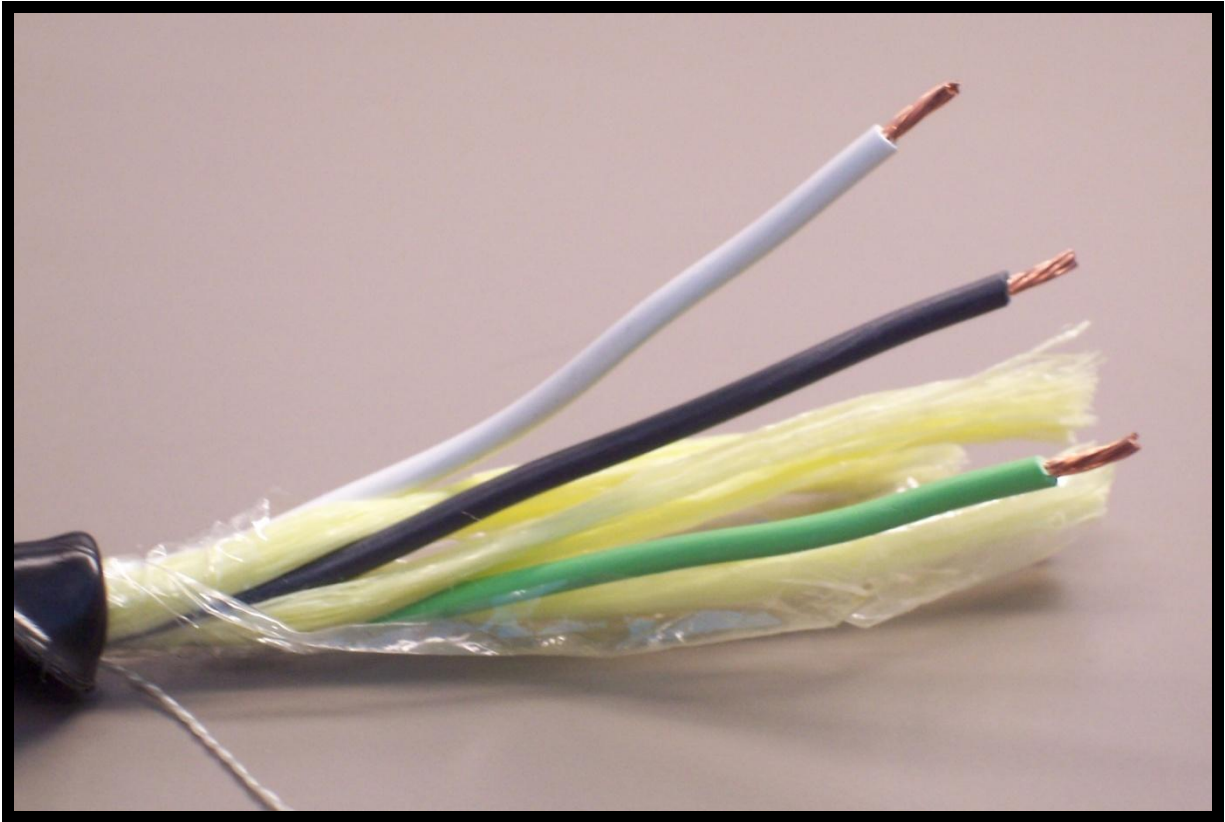


Single conductor wire must be stranded copper conforming to the American National Standards Institute and the National Electrical Code and shall be rated at 600 volts.



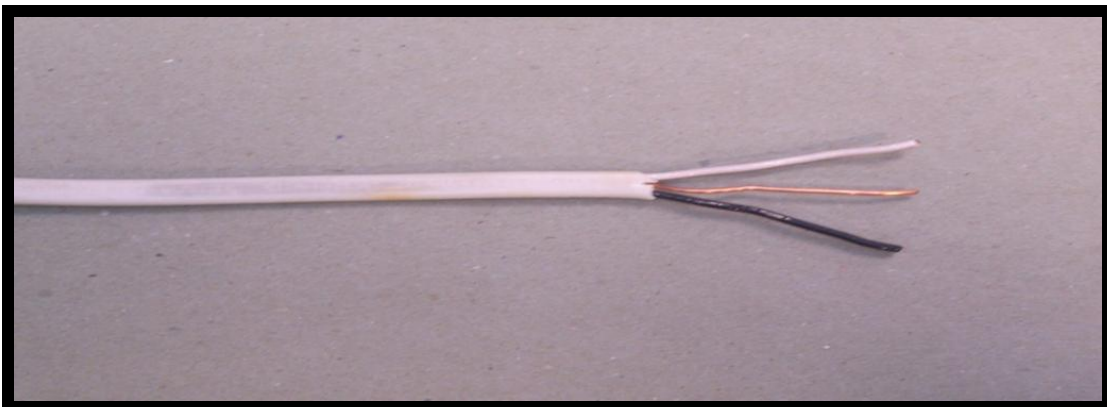
The Contract documents will specify all requirements (including cable markings, cable construction, color code, etc.) for electrical cables and conductors to be used on a Mn/DOT traffic signal or roadway lighting system.

Traffic signal control cable from the signal cabinet to the signal pole transformer base must be stranded copper with a conductor size of number 14 AWG and rated for 600 volts.



Traffic signal control cable 3C #14 (with ground conductor) must be stranded copper with a conductor size of number 14 AWG and rated for 600 volts. This cable is used for the luminaries atop the traffic signal poles and emergency vehicle preemption confirmation lights.

Type 12-2 UF (with ground) cables must run from the light base to the luminaire on roadway lighting projects only.



Traffic signal control cables are usually inspected at the distributor by Mn/DOT. Documentation (cut sheet) showing project number, reel number(s), and Mn/DOT test number(s) will be included with each project shipment. If this documentation is not with the shipment, a sample of the cable must be sent to the Mn/DOT lab for testing along with material certification from the manufacturer. Testing at the Mn/DOT Materials Lab must be completed before cable is installed on the project.

TRAFFIC SIGNAL CUT SHEET
Graybar Electric

Delivery Doc: _____ DATE _____
*Customer _____ *Project Number _____
*Project Location _____

CONTACT LISA MATUSKA EXT 3511 WITH QUESTIONS

SPECIAL INSTRUCTIONS: _____

| QUANTITY (CSR) | CATALOG# (CSR) | REEL/BATCH# (WIRE DEPT.) | MN DOT TEST# (w. EL07-0814) (WIRE DEPT.) | Balance remaining on Reel (WIRE DEPT.) |
|----------------|---------------------|--------------------------|--|--|
| 4995 | 14-2CS-LLL-CUT REEL | 14234 | CO-EL08-0449 | 0 |
| 4995 | 14-2CS-LLL-CUT REEL | 14235 | CO-EL08-0450 | 0 |
| 5565 | 14-2CS-LLL-CUT REEL | 14237 | CO-EL08-0452 | 0 |
| 5405 | 14-2CS-LLL-CUT REEL | 14241 | CO-EL08-0456 | 0 |
| 570 | 14-4C-TSC-CUT REEL | 153969 | EL09-0038 | 0 |
| 4995 | 20-3CS-LLI | 157319 | CO-EL08-0426 | 0 |
| 4995 | 14-12C-TSC-CUT REEL | 157208 | EL09-0039 | 0 |
| 5500 | 14-4C-TSC-CUT REEL | 157200 | EL09-0045 | 0 |
| 4995 | 14-3C-TSC-CUT REEL | 157182 | EL09-0039 | 0 |
| 2205 | 14-12C-TSC-CUT REEL | 157207 | EL09-0039 | 0 |
| 2205 | 14-3C-TSC-CUT REEL | 157181 | EL09-0039 | 0 |

MINNESOTA DEPARTMENT OF TRANSPORTATION
INSPECTION REPORT ON ELECTRICAL WIRE

DATE: 8/22/06 REPORT NO.: 06-001
AUTH. NO.: _____ S.P. NO.: 62-046-19
ORDER NO.: _____ DNDKE NO.: _____
MAINT. DIST.: _____ CONTRACT NO.: 1062
SUPPLIER: _____ INVOICE / ORDER NO.: 10186-62-E
LOCATION: MPLD
CONTRACTOR: _____
DESTINATION: RAMSEY CO.
CONCRETE: _____
ENGINEER: _____

| SPEC. | WIRE SIZE | DESCRIPTION | REEL # | LAB # | QUANTITY | UNITS |
|-------|-----------|------------------------|--------|---------|----------|--------|
| 3815 | 12#12 | TRAFFIC SIGNAL CABLE | 761 | 05-470 | 850 | L.F.T. |
| | 20#14 | REDUCED DIAMETER CABLE | 1019 | 05-145 | 150 | L.F.T. |
| | 4#214 | REDUCED DIAMETER CABLE | 1033 | 05-314 | 400 | L.F.T. |
| | 12#14 | REDUCED DIAMETER CABLE | 1037 | 05-319 | 200 | L.F.T. |
| | 20#12 | TRAFFIC SIGNAL CABLE | 853 | 06-0094 | 850 | L.F.T. |
| TOTAL | | | | | 1550 | L.F.T. |

REMARKS: MEETS REQUIREMENTS - APPROVED 3-27-2006

COPIES TO: _____ SIGNED: MATERIALS INSPECTOR

36.00 - 1248

After Mn/DOT approves cable at the distributor and a shipment is made to the project, a form is completed by the Mn/DOT Lab Inspector and sent to the Mn/DOT project Engineer. The project Engineer or Mn/DOT field inspector should compare this document to the cut sheet provided by the Contractor with the shipment of cable to ensure that the cable arriving on the job site has, in fact, been inspected and approved by Mn/DOT.

The inspector must record this information on the Materials Inspection Form as the wire is furnished to the job site.

Cables must be inspected and approved before installation. The Contractor must be reminded of this at the pre-construction meeting.

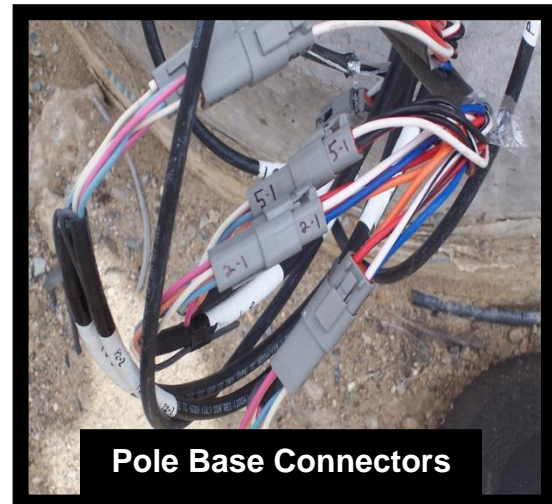
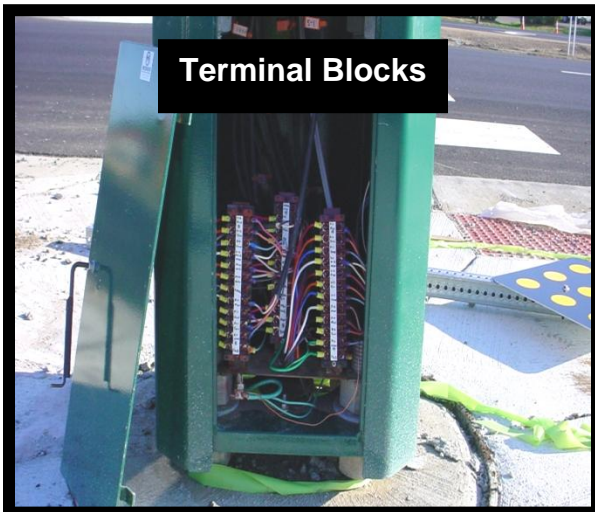
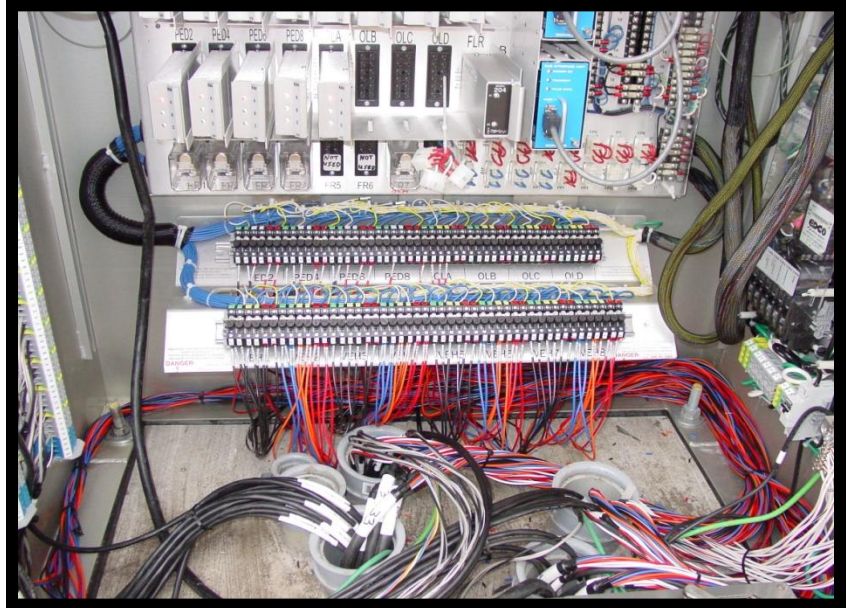
Project Certification for Lighting, Signals, & Traffic Recorder Materials Sheet 1 of 4

S.P. _____ Date _____
T.H. _____ Inspector _____

| SPEC | SIZE | ITEM | PRODUCER | QUANT. | LAB INSP. TEST NO. | REMARKS |
|---------|--------|-------------------------------------|----------|--------|--------------------|---------|
| 3801 | 1" | 27mm R.S.C. | | | UL Listed | |
| | 1 1/4" | 35mm | | | UL Listed | |
| | 1 1/2" | 41mm | | | UL Listed | |
| | 2" | 53mm | | | UL Listed | |
| | 2 1/2" | 63mm | | | UL Listed | |
| | 3" | 78mm | | | UL Listed | |
| | 4" | 103mm | | | UL Listed | |
| 3803 | 3/4" | 20mm N.M.C. | | | UL Listed | |
| | 1" | 25mm | | | UL Listed | |
| | 1 1/4" | 32mm | | | UL Listed | |
| | 2" | 50mm | | | UL Listed | |
| | 3" | 75mm | | | UL Listed | |
| | 4" | 100mm | | | UL Listed | |
| 3301 | | Reinforcement bars | | | | |
| PLANS | | 7/16 Siemens Martin Grade Span Wire | | | | |
| 3840 | | Wood Pole Class II | | | App'd in Field | |
| 3385 | | Anchor Bolts | | | App'd by B.N. | |
| Z565.3J | | Ground Rods | | | App'd by B.N. | |

Any cables, not having the inspection documentation when furnished for installation, must be sampled and submitted to the Mn/DOT Materials Lab for testing. Once the wire is approved by the Mn/DOT Materials Lab, the contractor can install it.

All electrical cables and conductors (except loop detector conductors) must be continuous (without splices) from the terminal appliances in the traffic signal cabinet.....



.....to the terminal appliances in the mast arm pole bases, pedestal bases and junction boxes.

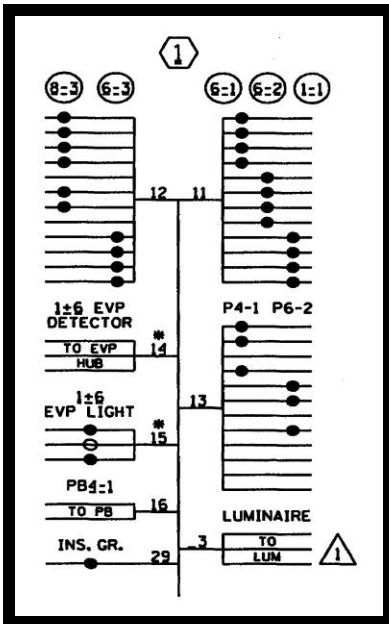
Installing splices that are not authorized by the Contract are not allowed. If it becomes necessary to splice a cable, the Engineer must approve it in writing. Unless otherwise specified, splices must be confined to handholes, control cabinets, junction boxes and the bases of poles. If underground cable splices are specified, they must be made using an approved epoxy splice kit listed on the Mn/DOT Approved Products List for Signals. Additional details about splices are listed in spec. 2565.3J.



(A)

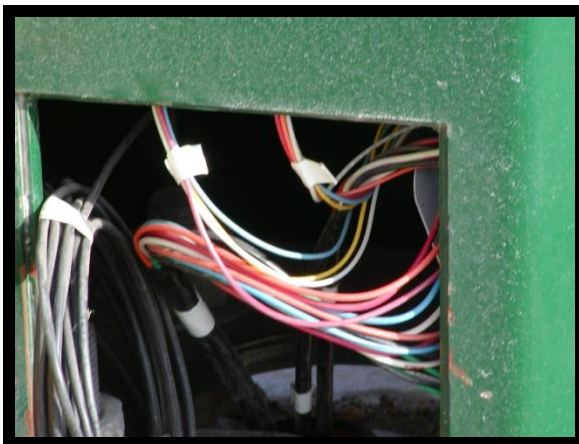
W.B. STA. 171+46, 43' LT.
 EQUIPMENT PAD (SEE SHEET NO. 2)
 SERVICE CABINET (SEE SHEET NO. 3)
 MASTER CONTROLLER, CONTROLLER AND CABINET
 4" CONDUIT TO HH 1 4" CONDUIT TO HH 15
 3-12/C#14 3-12/C#14
 4-3/C#14 3-3/C#14
 10-2/C#14 11-2/C#14
 2-3/C#20 2-3/C#20
 1-6PR#19 1-6PR#19
 1-1/C#6 INS. GR. 1-1/C#6 INS. GR.
 3" CONDUIT STUBBED OUT (THREADED AND CAPPED
 BOTH ENDS)
 2" CONDUIT TO SERVICE CABINET
 2-1/C#6
 1-1/C#6 INS. GR.

The size and number of conductors in each cable and the number of cables in a conduit run must conform to those shown in the Plan.



The Contractor must wire the electrical system in accordance with the Field Wiring Diagram shown in the Plans.

Approximately 3 feet (1 meter) of slack cable must be left in each handhole that houses a cable run and...



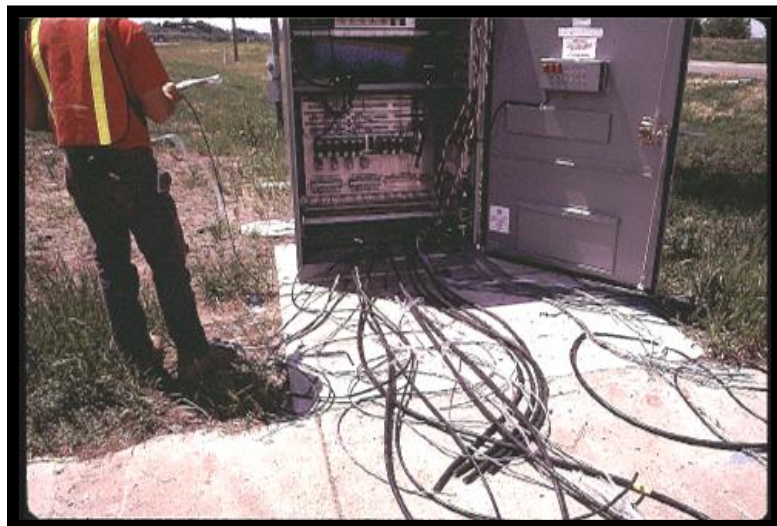
...approximately 2 feet (600 millimeters) of slack cable must be left in each mast arm pole base, light standard base and pedestal base.

Unmetered service conductors must be installed in a separate conduit system and all conductors of a branch circuit must be run in a single conduit.



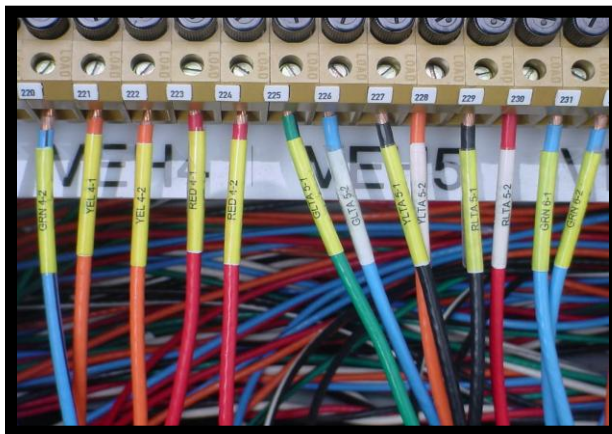
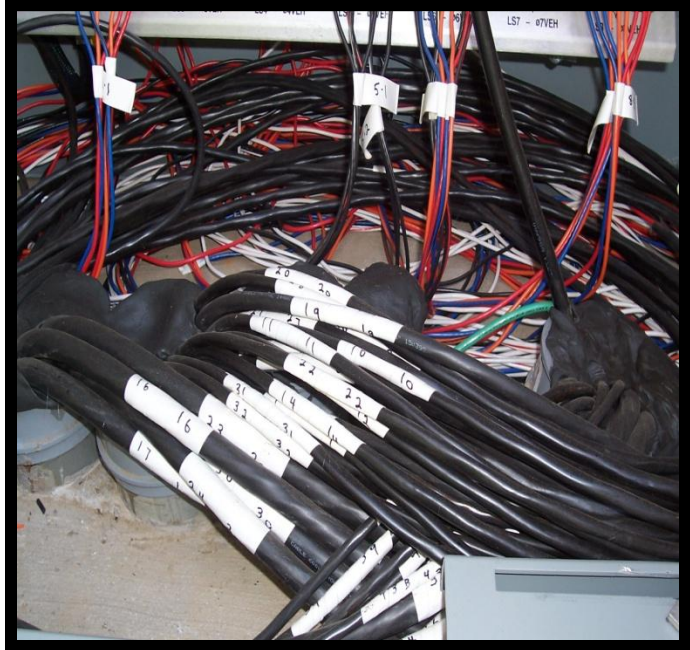
Loop lead-in cable (2/C #14) must be continuous from the splice in the handhole to traffic signal cabinet.

Field leads entering a traffic signal cabinet (or other cabinet) must not be cut shorter than the furthestmost terminal in the cabinet. After all field connections are made to the cabinet terminal facilities, field leads must be neatly dressed and banded together to provide an orderly arrangement inside the cabinet. The ends of all spares not terminated must be taped to prevent moisture contamination of the wire.

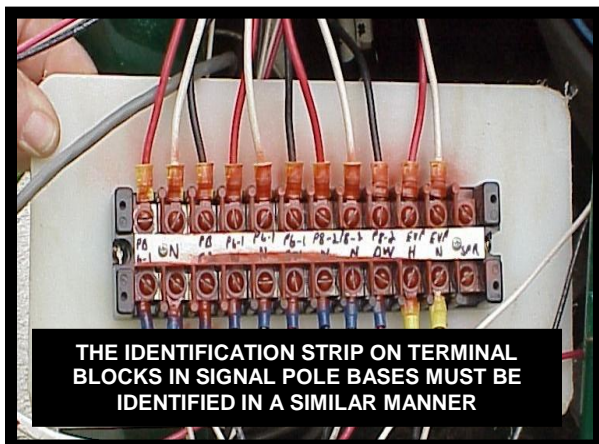


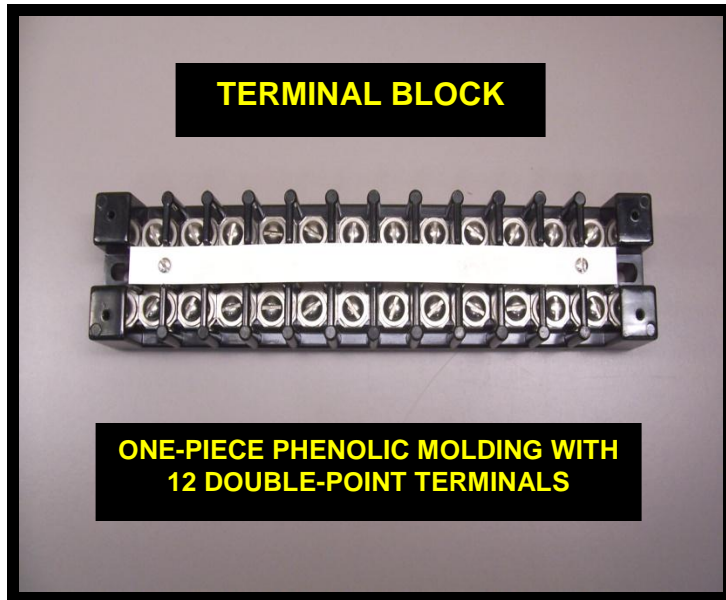
The labels used to identify cables (except at the signal indication fuse panels) must be made of white vinyl adhesive tape wrapped around the cable. Cables must be identified as shown in the field wiring diagram in all handholes, junction boxes, traffic signal pedestal bases, mast arm pole bases and the cabinet.

Labels to identify the individual conductors terminated at the signal indication fuse panels must use either machine printed labels embossed plastic labels, vinyl adhesive preprinted labels, or sleeve type labels placed around each conductor



In addition to labeling each cable within the cabinet, the Contractor must label, in a similar manner, each conductor of each cable terminated on the fuse panel or terminal block (RED 2-1, YEL 2-1, GRN 2-1 and so on) indicating the signal indication and the signal face number. The label must be applied within 3 inches (75 millimeters) of the terminal point.

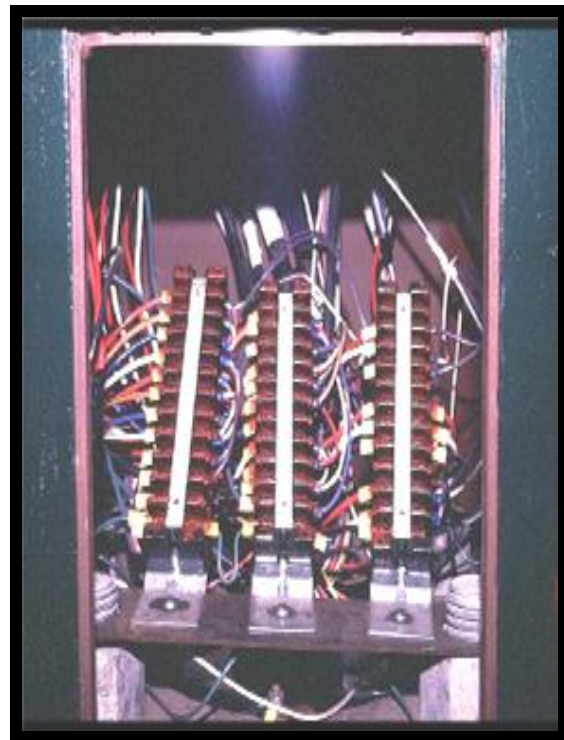




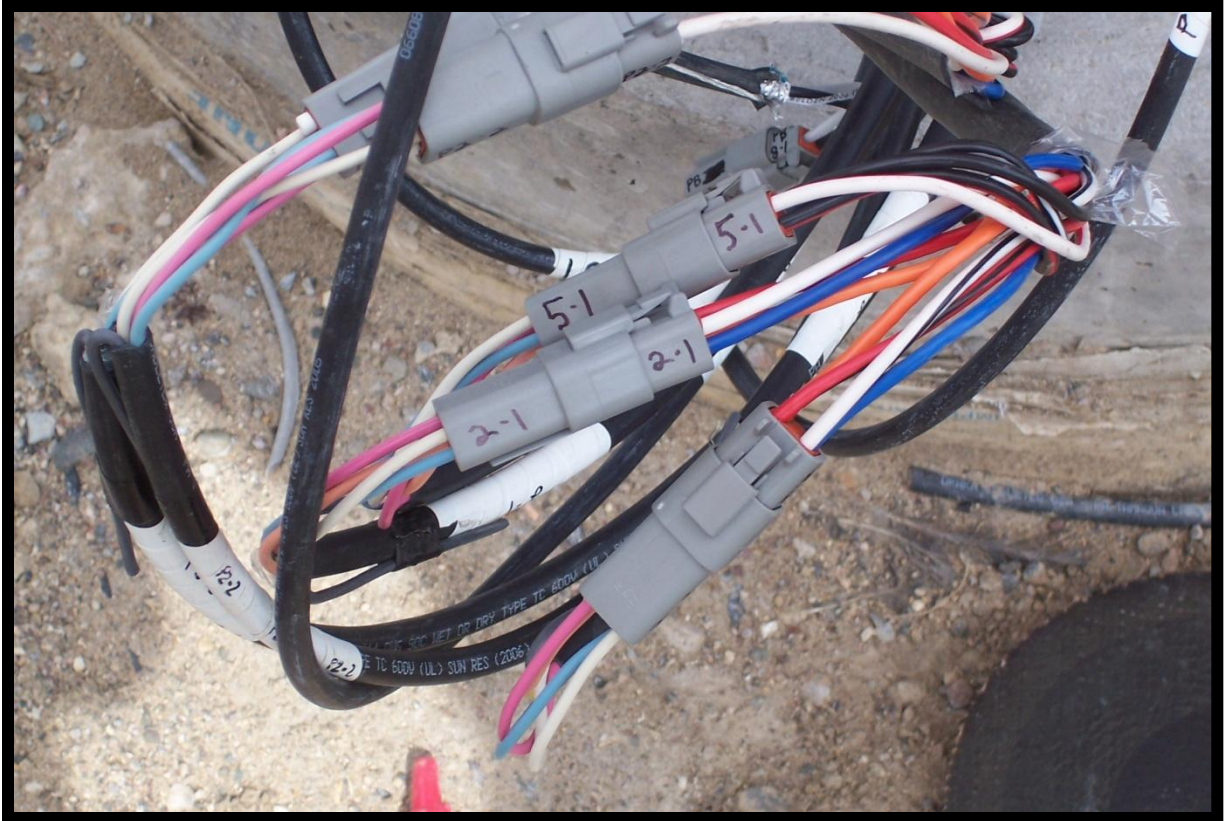
A detailed description of terminal blocks is provided in 2565.3 of the Spec. Book. When required by the Contract documents, each mast arm pole base, traffic signal pedestal base, etc. with vehicle and/or pedestrian signal indications must have a terminal block for terminating field leads. Each block must meet the 600 volt NEMA and UL requirements for general industrial control devices.

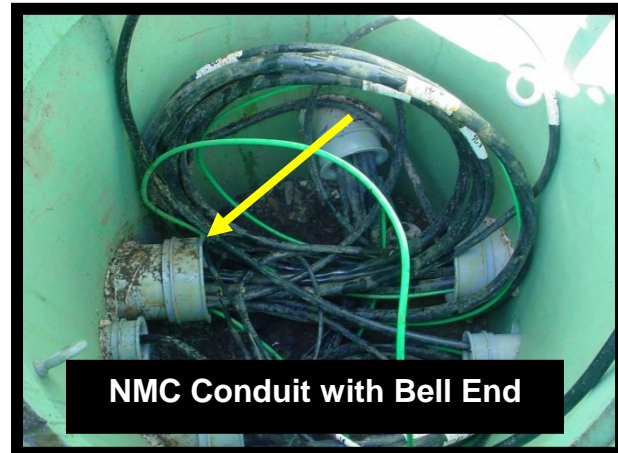
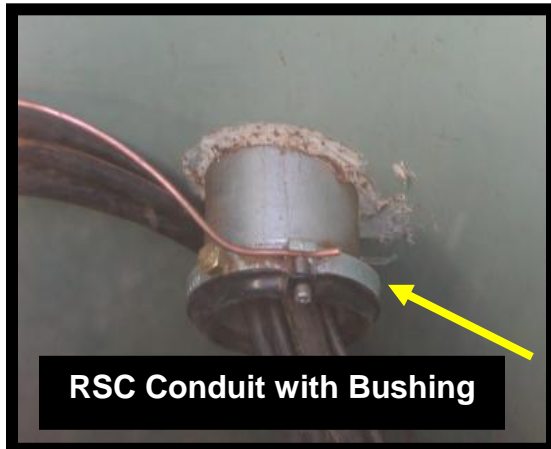
Terminal blocks, screws, and spade lugs must be covered or sprayed with approved electrical insulating coat in each base after the system has been made fully operational. Mn/DOT approved electrical insulating sprays are listed on the Mn/Dot Approved Products List for Signals. The coating of the terminal block must include spraying the terminal connections and the exposed wire ends where crimped to the spade connector.

Terminal blocks in bases must be installed in such a manner that the terminal block screws of the block are facing the door opening (unless otherwise directed by the Engineer) and are accessible.



When required by the Contract documents, each mast arm pole base, traffic signal pedestal base, etc. with vehicle and/or pedestrian signal indications must have pole base connectors as specified in the Contract documents. Pole base connectors, pins, sockets, sealing plugs, and hand crimp tool must be Mn/DOT approved as listed on the Mn/DOT Approved Products List for Signals.





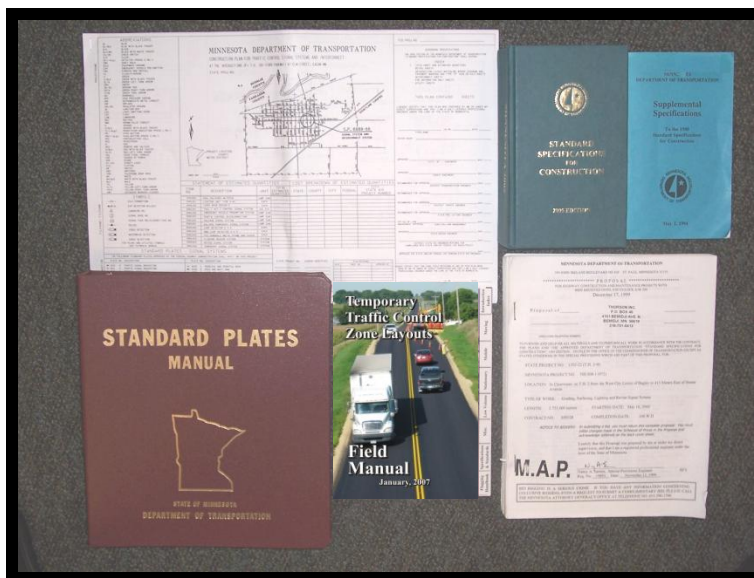
Conduit must be clean before cables and wire are installed. All electrical cables and wires must be pulled through the conduit by hand so that no damage is done to the conductors and insulation. The ends of all cables and conductors must be taped to prevent moisture entering the conductors until spliced or terminated. Before direct buried cable enters or exits handholes a bushing (RSC Conduit) or bell end (NMC conduit) must be installed on the conduit to prevent damage to the insulation of the cable.

Above Ground Wiring

All electrical cables and conductors installed aboveground, except on overhead span wires, must be installed in conduit attached to wood poles, in metal poles, cabinets or other structures.



If electrical cables and conductors are to be installed overhead unsupported and spanned between wood poles or supports, sufficient slack must be furnished (generally 5 percent of the span length). Cables and conductors installed overhead in conjunction with a messenger wire (span wire) must be attached to the messenger wire using approved straps with a maximum spacing as required by the contract documents. Straps must be approved by the Engineer prior to installation.



Refer to the contract documents for detailed requirements.