

## TRAFFIC SIGNAL NOTES

### 1. NEW EQUIPMENT

#### A. TRAFFIC SIGNAL HEADS

1. ALL TRAFFIC SIGNAL HEADS SHALL HAVE 12" LENSES. ALL HEADS MOUNTED ON SPAN WIRES SHALL BE POLYCARBONATE. ALL OTHER HEADS SHALL BE HEAVY DUTY ALUMINUM. ALL HOUSINGS SHALL BE FEDERAL YELLOW WITH FLAT BLACK DOORS & VISORS. ALL TRAFFIC SIGNALS SHALL HAVE DISCONNECT HANGERS WITH NON-ALUMINUM BALANCE ADJUSTER FITTINGS OR TERMINAL COMPARTMENTS.

#### B. TRAFFIC SIGNAL CONTROLLER & CABINET

1. THE UNIT SHALL BE AN ECONOLITE, EAGLE OR TCT BRAND CONTROLLER CAPABLE OF PRODUCING THE TIMING AND COORDINATION AS SHOWN ON THE PLANS. ALL CONTROLLERS SHALL HAVE A MINIMUM OF 8 PHASES. EACH PHASE (USED OR UNUSED) SHALL HAVE A LOAD SWITCH AND ALL NECESSARY FLASH TRANSFER RELAYS. EACH INSTALLATION SHALL INCLUDE TIME CLOCKS WITH BATTERY BACKUP, MINIMUM 12 CHANNEL CONFLICT MONITOR WITH STOP TIMING FUNCTION, LED DISPLAY LOAD SWITCHES (INPUT SIDE), REMOTE FLASHER, VEHICLE DETECTOR AMPLIFIERS, UNIFORM CODE FLASH UNIT (PER M.U.T.C.D.), RADIO INTERFERENCE FILTERS, SURGE PROTECTION, LAMP RECEPTACLE AND CONVENIENCE OUTLET WITH GROUND FAULT INTERRUPTION. ALL CONTROLLERS SHALL HAVE ALL NECESSARY HARDWARE & SOFTWARE FOR TIME-BASED COORDINATION (BACKUP), HARDWARE COORDINATION (BACKUP). THERE SHALL BE A WATERPROOF PLASTIC ENVELOPE ATTACHED TO THE CABINET INTERIOR FOR STORAGE OF THE CONTROLLER MANUAL AND PLAN SHEETS. THE CONTROLLERS/TBC SHALL BE SHIPPED FROM THE MANUFACTURER PRESET AND A REPRESENTATIVE OF THE MANUFACTURER SHALL BE ON THE PROJECT SITE FOR TURN ON OF THE UNIT. IN ADDITION TO EQUIPMENT FURNISHED TO PROVIDE A FUNCTIONAL SIGNAL SYSTEM. THE CONTRACTOR SHALL SUPPLY THE FOLLOWING SPARE PARTS; ONE LOAD SWITCH AND ONE TRANSFER RELAY PER INTERSECTION. THIS EQUIPMENT MAY BE USED DURING THE CONSTRUCTION PERIOD TO REPLACE MALFUNCTIONING EQUIPMENT BUT MUST BE REPLACED OR MAINTAINED IN THE CABINET PRIOR TO COMPLETION. THE CONTROLLER CABINET SHALL HAVE A POLISHED ALUMINUM NATURAL FINISH AND BE PROVIDED WITH A #2 LOCK. A PADLOCK (MASTER WITH A #3220 KEY) AND A STANDARD POLICE DOOR LOCK. EACH LOCK SHALL HAVE 2 KEYS. EACH CABINET SHALL INCLUDE A 120' - 170' FAN/THERMOSTAT (INITIALLY SET AT 120'). THE CABINET DOOR SHALL BE SUPPLIED WITH TEST SWITCHES FOR EACH PHASE. ANY DOOR MOUNTED TOGGLE SWITCHES SHALL BE PROTECTED FROM ACCIDENTAL BUMPING. EACH CABINET SHALL HAVE A METAL PLATE ATTACHED TO THE OUTSIDE INDICATING OWNERSHIP AND EMERGENCY PHONE NUMBERS (SEE DETAIL). A MAIN DISCONNECT BREAKER SHALL BE INSTALLED IN A RAIN TIGHT LOCKED CABINET EXTERNAL TO THE CONTROLLER. ALL CONFLICT MONITORS SHALL BE CAPABLE OF RECORDING AND STORING A MINIMUM OF 9" EVENTS". ALL LOAD SWITCHES SHALL BE LABELED ON THE CABINET WALL.

#### C. TRAFFIC SIGNAL CONDUIT

1. ALL TRAFFIC SIGNAL CONDUIT SHALL BE PVC WITH A 2" MINIMUM DIAMETER OR LARGER AS REQUIRED BY THE ELECTRICAL CODE. PAYMENT SHALL BE UNDER ITEM 678.21, ELECTRICAL CONDUIT.
2. THE MINIMUM DEPTH BELOW GROUND FOR THE PLACEMENT OF CONDUIT SHALL BE 3 FEET.
3. SIX INCH WIDE YELLOW PLASTIC MARKING TAPE SHALL BE PLACED IN THE EXCAVATED TRENCH 6 TO 12 INCHES BELOW THE FINISHED GRADE FOR ALL CONDUIT RUNS. PAYMENT SUBSIDIARY TO THE CONDUIT.

- D. ALL EQUIPMENT SHALL MEET OR EXCEED NEMA STANDARDS AND IMSA OR ITE SPECIFICATIONS. WHERE APPLICABLE.
- E. THE ELECTRIC CABLE SHALL BE ATTACHED TO THE SPAN WIRE WITH A STAINLESS ALLOY 430 LASHING (SPINNING) WIRE.
- F. STRANDED WIRE SHALL BE USED FOR ALL UNSUPPORTED AND SPAN WIRE SUPPORTED WIRE.
- G. NEW STRAIN POLES SHALL BE DESIGNED USING THE LATEST REVISION OF AASHTO'S "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS. LUMINAIRES AND TRAFFIC SIGNALS". DIAMETER, HEIGHT, YIELD STRENGTH AND GAGE SHALL BE STAMPED ON THE POLE BASE PLATE OR ON AN ATTACHED METAL TAG. LUMINAIRE ARMS SHALL MATCH THEIR PARENT STRUCTURE.

#### 2. REMOVAL OF EXISTING OR REUSE OF SALVAGED EQUIPMENT

- A. ALL REMOVED AND NOT REUSED EQUIPMENT (HEADS, CONTROLLERS, CABINETS, POLES, ETC.) SHALL BE RETURNED TO THE STATE OF VERMONT IMMEDIATELY FOLLOWING ITS REMOVAL UNLESS OTHERWISE NOTED. REMOVAL OF EQUIPMENT SHALL INCLUDE REMOVAL OF CONCRETE BASES (DISPOSAL BY CONTRACTOR) AND BACKFILL OF THE HOLES, WHERE APPLICABLE. ANY EQUIPMENT THAT IS DAMAGED BY THE CONTRACTOR DURING REMOVAL SHALL BE REPAIRED OR REPLACED, TO THE SATISFACTION OF THE STATE AT THE CONTRACTORS EXPENSE. ANY EQUIPMENT NOT WANTED BY THE STATE SHALL BE DISPOSED OF BY THE CONTRACTOR.

#### 3. SIGNAL OPERATION

- A. SIGNAL TIMING AND OFFSETS SHOWN ON THE PLANS MAY REQUIRE FINE-TUNING IN THE FIELD BASED ON TRAFFIC OBSERVATION. (COST OF ADJUSTMENTS SHALL BE SUBSIDIARY TO OTHER ITEMS).
- B. THE TRAFFIC SIGNALS SHALL NOT OPERATE WITHOUT THE PAVEMENT MARKINGS AND SIGNAL RELATED SIGNING IN PLACE.
- C. ALL SIGNALS SHALL DWELL ON THE MAIN LINE THRU MOVEMENT UNLESS OTHERWISE NOTED.

#### 4. VEHICLE LOOP DETECTORS

- A. ALL LOOP DETECTORS SHALL BE LABELED WITH PHASE NUMBER, APPROACH DIRECTION AND MOVEMENT CONTROLLED BY THE UNIT. (I.E. PHASE 1, NB LT.)
- B. ALL LOOP AMPS SHALL BE OF A TYPE THAT FAIL ON.
- C. EACH LOOP SHALL HAVE ITS OWN AMP.
- D. SEE STANDARD E-172 FOR ADDITIONAL NOTES.
- E. # 12 WIRE SHALL BE USED FOR ALL LOOPS & LEAD-INS.

#### 5. STREET LIGHTING

- A. ALL STREET LIGHTS ON STRAIN POLES SHALL USE THE SAME POWER (DIFFERENT CIRCUIT) AS SIGNALS. WIRING OF THE LUMINAIRES SHALL BE BY THE SIGNAL SUBCONTRACTOR.
- B. THE LUMINAIRES SHALL BE DESIGNED FOR STREET LIGHTING AND THE INDICATED LIGHT DISTRIBUTION. THEY SHALL INCLUDE AN ALUMINUM HOUSING WITH EASY ACCESS TO THE BALLAST ASSEMBLY, PHOTOELECTRIC CONTROL, FILTERED OPTICAL ASSEMBLY, AND REGULATOR BALLAST FOR 120 VOLT LAMPS. THE BALLAST SHALL BE MATCHED TO ITS STARTING CIRCUIT. WIRING SHALL BE NEAT, BUNDLED, AND KEPT AWAY FROM EXCESS HEAT. THE INSTALLED LUMINAIRE LIGHT UTILIZATION AND MINIMUM FOOTCANDLES SHALL BE AT LEAST AS GREAT AS ON THE INDICATED PHOTOMETRIC DATA SHEET. THE LUMINAIRES SHALL BE INSTALLED AS SHOWN ON THE PLANS.

#### 6. GENERAL

- A. ALL ELECTRICAL WORK AND MATERIALS SHALL BE SUBJECT TO INSPECTION AND APPROVAL OF THE STATE ELECTRICAL INSPECTOR. ALL WORK MUST MEET THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.
- B. AFTER PROJECT ACCEPTANCE, THE TRAFFIC SIGNAL INSTALLATIONS SHALL BECOME THE PROPERTY AND RESPONSIBILITY OF THE STATE OF VERMONT.
- C. THE CONTRACTOR SHALL ACQUIRE ALL NECESSARY PERITS AND MAKE ALL NECESSARY ARRANGEMENTS WITH THE UTILITY COMPANY TO PROVIDE A PERMANENT POWER SUPPLY TO THE SIGNAL.
- D. THE REQUIRED 30-DAY TEST PERIOD FOR THE SIGNAL EQUIPMENT SHALL NOT BEGIN UNTIL ALL CONSTRUCTION IS COMPLETE AND ALL PAPERWORK HAS BEEN DONE TO THE SATISFACTION OF THE AGENCY.

## SUBMITTAL OF SHOP DRAWINGS

- I. THE MANUFACTURER SHALL SUBMIT, FOR APPROVAL, SHOP DRAWINGS FOR TRAFFIC SIGNAL EQUIPMENT. THE SUBMITTAL SHALL CONTAIN A MINIMUM OF THE FOLLOWING INFORMATION:

#### A. TRAFFIC SIGNAL CONTROLLER

TYPE OF CONTROLLER, MANUFACTURER, MODEL, NUMBER OF PHASES AND FUNCTIONS, ASSURANCE OF CONFORMANCE TO THE LATEST NEMA STANDARDS. BENCH TESTING (MINIMUM OF 7 DAYS) WILL BE REQUIRED. COPIES OF THE TEST RESULTS SHALL BE SUBMITTED AS DISCUSSED IN THE STANDARD SPECS SECTION 752.06. THE TEST RESULTS SHALL CONTAIN THE BEGIN AND END TIME AND DATE. ALL CONTROLLER AND TIME-BASED COORDINATOR SETTINGS USED, EQUIPMENT SERIAL NUMBERS, SIGNATURE OF THE PERSON PERFORMING THE TEST AND SIGNATURE OF A WITNESS WHO SHALL BE EITHER A REGISTERED ELECTRICAL ENGINEER OR A LICENSED MASTER ELECTRICIAN.

#### B. TRAFFIC SIGNAL HEADS

SIZE, MANUFACTURER, MODEL, LAMP WATTAGE, OPTICS, WIRING, HOUSING (MATERIAL AND COLOR), VISORS, AND BACK PLATES, IF REQUIRED. THE SIGNAL HEADS SHALL MEET THE LATEST ITE STANDARDS.

#### C. CONTROLLER CABINET

SIZE, MANUFACTURER, ACCESSORIES, MATERIALS, AND FINISH.

#### D. AUXILIARY EQUIPMENT (FLASHERS), VEHICLE DETECTORS, CONFLICT MONITOR, CLOCK(S), ETC.

MANUFACTURER, MODEL, FUNCTIONS, ASSURANCE OF CONFORMANCE TO THE LATEST NEMA STANDARDS, WHERE APPLICABLE.

#### E. STRAIN POLES, PEDESTAL POSTS AND CANTILEVERS.

1. DIMENSIONS - POLE/POST HEIGHT, SPAN WIRE ATTACHMENT HEIGHT, POLE/POST DIAMETER (TOP AND BOTTOM), POLE GAUGE, HANDHOLE (SIZE AND LOCATION), BASE PLATE, BOLT CIRCLE,

#### 2. MATERIAL SPECIFICATIONS FOR EACH COMPONENT.

3. ANCHOR BOLTS AND WASHERS SHALL BE AN AUSTENITIC GRADE OF STAINLESS STEEL CONFORMING TO THE CHEMISTRY OF ASTM A276 TYPE 304 WITH THE FOLLOWING PHYSICAL PROPERTIES:

- |  |            |
|--|------------|
| A) TENSILE STRENGTH, MINIMUM           | 80,000 PSI |
| B) YIELD STRENGTH, MINIMUM             | 55,000 PSI |
| C) ELONGATION IN 2 INCHES, MINIMUM     | 25%        |
| D) ROCKWELL B HARDNESS, MINIMUM        | 86         |
| OR CHARPY V-NOTCH (AASHTO T243 USING H | 15 FT.-LBS |
| FREQUENCY OF TESTING) MINIMUM          | ④ 40' F    |
- NUTS FOR THE ANCHOR BOLTS SHALL BE THE HEAVY HEX TYPE CONFORMING TO THE REQUIREMENTS OF ASTM A-194 GRADE 8.

4. WELDING INFORMATION FOR ALL WELDED CONNECTIONS (SEE SUBSECTION 506.10). THE FOLLOWING INFORMATION WILL BE REQUIRED FOR ALL WELDED JOINTS (ALUMINUM OR STEEL):

- A). PROCEDURE SPECIFICATIONS PER AWS D1.1 APPENDIX E FROM E1
- B). PROCESS AND PROCEDURE QUALIFICATION TESTS PER AWS D1.1 APPENDIX E FORM E2.
- C). CERTIFICATE OR CONFORMANCE TO SPECIFICATIONS FOR FILLER MATERIAL, WHEN USING ANY GMAW OR FCAW WELDING PROCESS THE FOLLOWING WILL ALSO BE REQUIRED:  
A MANUFACTURER'S CERTIFICATE THAT THE GAS OR GAS MIXTURE IS SUITABLE FOR THE INTENDED APPLICATION AND MEETS THE DEW POINT REQUIREMENTS.  
REFERENCE - AASHTO MODIFICATION OF AWS D1.1 SEC.4.18

#### 5. POLE/BASE PLATE STAMPING DETAIL

6. SPECIAL FEATURES AS INDICATED ON THE PLANS SUCH AS FINISH OR COLOR.

- II. THE MANUFACTURER SHALL SUBMIT, FOR APPROVAL, SHOP DRAWING FOR THE STREET LIGHT LUMINAIRE THE SUBMITTAL SHALL CONTAIN, AT A MINIMUM, THE FOLLOWING INFORMATION:

#### A) LUMINAIRES

##### 1. FIXTURES

- A) VOLTAGE RATING
- B) WATTAGE AND LAMP TYPE
- C) BALLAST TYPE
- D) PHOTO CELL
- E) ANY OTHER FEATURES SPECIFIED ON THE PLANS SUCH AS FINISH SPECIAL WIRE ACCESS, ETC.

##### 2. PHOTOMETRIC DATA

- A) IES DISTRIBUTION TYPE
- B) UTILIZATION CURVE
- C) ISO - FOOT - CANDLE CURVES
- D) MOUNTING HEIGHT FACTOR
- E) MAINTENANCE FACTOR

##### B) WIRING

CONDUCTOR MATERIAL, INSULATION TYPE, VOLTAGE RATING, AND TEMPERATURE RATINGS, SHALL CONFORM TO THE NATION ELECTRIC CODE USE AND SIZE AND BE COLOR CODED.

- III. IN I AND II ABOVE, THE INFORMATION SUPPLIED SHALL EITHER MATCH OR BE EQUIVALENT TO THE DETAILS SPECIFIED ON THE PLANS OR ON THE STD. SHEETS. IF EQUIVALENT, THE CONTRACTOR MAY BE ASKED TO SUPPLY PROOF OF EQUIVALENCY. COPIES OF CATALOGUE SHEETS ARE ACCEPTABLE IF ALL THE APPROPRIATE INFORMATION IS INCLUDED.

## TRAFFIC SIGNAL & SHOP DRAWING NOTES

PREPARED BY	JAS	DATE	2/91
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PROJ.	PB 033-1(2)
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