

CANTILEVER SIGNAL SUPPORT NOTES

1. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE STATE OF VERMONT AGENCY OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR CONSTRUCTION", DATED 1990, THE TOWN OF WILLISTON PUBLIC WORKS STANDARDS AND SUPPLEMENTAL SPECS. 678 AND 752.
2. OVERHEAD SIGN/SIGNAL SUPPORTS SHALL CONFORM TO AASHTO'S PUBLICATION ENTITLED "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS", DATED 1994 OR ITS LATEST REVISIONS.
3. ADDITIONAL DESIGN CRITERIA ARE AS FOLLOWS:
 CONCRETE $f_c = 1400$ PSI $f'_c = 3500$ PSI
 REINFORCING $f_s = 24000$ PSI (GRADE 60)
 FOOTING SOIL PRESSURE : 3000 PSF (MAXIMUM)

 WIND LOAD AND ICE LOAD PER AASHTO "STANDARD SPECIFICATIONS"
4. ANCHOR BOLTS
 FOUR STAINLESS STEEL ANCHOR BOLTS WITH TWO HEXAGON NUTS, TWO WASHERS AND ONE LOCK WASHER PER BOLT SHALL BE FURNISHED WITH EACH POLE. SEE SUB-SECTION 714.09.
5. FLANGE BOLTS
 ALL FLANGE BOLTS AND HEX NUTS SHALL BE HIGH STRENGTH TYPE 1, GALVANIZED STEEL AND SHALL CONFORM TO AASHTO M164. THE FLANGE BOLTS SHALL BE CAPABLE OF RESISTING 133% OF THE FULL DESIGN STRESS OF THE TUBE AT ITS YIELD STRENGTH STRESS.
6. HORIZONTAL AND VERTICAL MEMBERS
 STEEL TUBES SHALL BE FORMED AND WELDED WITH ONE CONTINUOUS LONGITUDINAL WELD ONLY. AFTER FORMING AND WELDING THEY SHALL BE COLD ROLLED TO ENSURE UNIFORMITY OF SIZE AND SMOOTHNESS OF WELD. THEY SHALL HAVE A MINIMUM YIELD STRENGTH OF 48,000 PSI. THERE SHALL BE NO TRANSVERSE WELDING EXCEPT AT THE FLANGE CONNECTIONS AND POLE BASE PLATES, WHERE THE TUBES SHALL TELESCOPE THE FLANGES AND PLATES AND BE CONTINUOUSLY WELDED BOTH SIDES INSIDE AND OUT TO WITHSTAND THE FULL TRANSFER OF THE BENDING STRENGTH TO THE BOLTS. OPTIONALLY, THE MEMBERS MAY BE A SERIES OF TWO OR THREE DIFFERENT DIAMETER PIPES WELDED TOGETHER.
7. GALVANIZING
 ALL STEEL COMPONENTS, EXCEPT CONCRETE REINFORCING AND STAINLESS STEEL HARDWARE, ARE TO BE HOT DIPPED GALVANIZED AFTER FABRICATION. THE ASSEMBLIES SHALL BE DESIGNED AND FABRICATED TO PERMIT GALVANIZING ON ALL INTERIOR AND EXTERIOR SURFACES AND SHALL BE FREE OF POCKETS AND OTHER STRUCTURAL OBSTRUCTIONS THAT WILL NOT PERMIT PROPER DEPOSITION OF ZINC COATING. GALVANIZING SHALL BE IN ACCORDANCE WITH AASHTO M111 AND M232M/ M232.
8. WELDING
 A. ALL DESIGN DETAILS, WORKMANSHIP, PROCEDURES AND INSPECTION SHALL CONFORM WITH SUB-SECTION 506.10.
 B. ALL WELDS SHALL BE AT LEAST AS STRONG AS THE MATERIAL(S) BEING WELDED.
9. FOOTINGS
 A. FOOTINGS SHALL BE DESIGNED TO RESIST LOADS EQUAL TO, OR GREATER THAN, THE MAXIMUM LOADS THAT THE POLE IS DESIGNED FOR.
 B. THREE TYPES OF FOUNDATIONS, AS OUTLINED IN AASHTO "STANDARD SPECIFICATIONS (SEE NOTE 2) SECTION 1.8.2 (C) SHALL BE ALLOWED.
 1. DRILLED SHAFTS
 2. SPREAD FOOTINGS
 3. PILES
 C. DRILLED SHAFT FOOTINGS SHALL BE POURED IN DRILLED SHAFTS AGAINST UNDISTURBED MATERIAL. THE TOP TWO FEET OF SOIL SHALL BE NEGLECTED FOR DESIGN PURPOSES. THE MAXIMUM FOOTING DIAMETER SHALL BE 3.5 FEET AND THE MAXIMUM DEPTH SHALL BE 12 FEET. IF THESE LIMITS ARE EXCEEDED OR IF THE SOIL IS NOT CAPABLE OF A BEARING PRESSURE OF 3000 PSF, A SPREAD FOOTING SHALL BE USED.
 D. AS AN ALTERNATIVE TO THE DRILLED HOLES, FOOTINGS MAY BE POURED IN EXCAVATED HOLES USING THE PROPER FORMS, WHICH MUST BE REMOVED. THE EXCAVATED HOLES SHALL BE AT LEAST TWO FEET CLEAR OF THE FOOTING. THE BACKFILL MATERIAL SHALL BE COMPACTED AS DESCRIBED IN SUB-SECTION 204.12. DESIGN LIMITS AS FOR AUGURED FOOTINGS APPLY.
 E. WHEN THE DESIGN DEPTH OF A FOOTING CANNOT BE OBTAINED DUE TO UNFORSEEN FIELD CONDITIONS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND OBTAIN A REVISED FOOTING DETAIL FROM THE ENGINEER.
 F. ANY BACKFILL PLACED ADJACENT TO THE FOOTING SHALL BE GRANULAR MATERIAL MEETING THE REQUIREMENTS FOR GRANULAR BACKFILL FOR STRUCTURES, SUB-SECTION 704.08. CONCRETE FOR FOOTING SHALL CONFORM TO THE REQUIREMENTS OF CONCRETE, CLASS B, SECTION 501, STRUCTURAL CONCRETE. GROUT MATERIAL SHALL BE NON-SHRINKING MORTAR CONFORMING TO SUB-SECTION 707.03 (MORTAR TYPE IV).

- G. THE TRAFFIC SIGNAL CANTILEVER MAST ARM POLES SHALL BE BACK RAKED BEFORE THE WIRES AND SIGNALS ARE INSTALLED SO THAT THE POLES WILL BE PLUMB WHEN DEAD LOAD DEFLECTION DUE TO SIGNAL HEADS OCCURS. THE AMOUNT OF BACKRAKE SHALL BE AS SHOWN ON THE PLANS. SIGNALS/SIGNS SHALL BE MOUNTED AND LEVELED AND POLES SHALL BE BACKRAKED PRIOR TO PLACING GROUT UNDER POLE BASE.
10. SHOP DRAWINGS (6 COPIES OF EACH) SHALL BE SUBMITTED TO THE AOT & DESIGN ENGINEER FOR APPROVAL PRIOR TO FABRICATION. THE SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING INFORMATION:
 - A. DETAILED DRAWING OF EACH COMPONENT OF THE STRUCTURE
 - B. MATERIAL SPECIFICATIONS FOR EACH COMPONENT OF THE STRUCTURE, EITHER BY COMPLETE SPECIFICATION OR REFERENCE TO APPLICABLE ASTM STANDARDS.
 - C. NOTATION OF PROJECT NAME, PROJECT NUMBER, ROUTE NUMBER, AND STRUCTURE STATIONING (TO BE INCLUDED ON EACH SHEET).
 - D. DETAILS FOR LOCATION OF SIGNS/SIGNALS AND ATTACHMENT HARDWARE FOR THE SUPPORT STRUCTURE.
 - E. ALL ELEVATION AND DIMENSIONS NECESSARY TO PROVIDE A COMPLETE SET OF RECORD PLANS.
 - F. DEAD LOAD DEFLECTION AND CAMBER INFORMATION.
 - G. WELDING DETAILS AND PROCEDURES ARE REQUIRED FOR ALL WELDS. PROCEDURES SHALL BE SUBMITTED FOR APPROVAL WITH REFERENCE TO EACH WELD IDENTIFIED ON THE SHOP DRAWINGS. (SEE SUBSECTION 506.10)
11. EACH OVERHEAD TRAFFIC SIGNAL/SIGN SUPPORT SHALL BE GROUNDED. THE GROUND SHALL CONSIST OF:
 - A) AN INTERNAL GROUND LUG OPPOSITE THE HAND HOLE.
 - B) A #6 (MIN.) SOFT DRAWN COPPER GROUNDING ELECTRODE CONDUCTOR.
 - C) A 5/8" X 8' (MIN.) COPPER CLAD GROUNDING ELECTRODE.

THE RESISTANCE TO GROUND SHALL BE 25 OHMS OR LESS. ADDITIONAL GROUNDING ELECTRODES MAY BE REQUIRED (MINIMUM SPACING SHALL BE 6'). WHEN A POWER SERVICE, METER AND DISCONNECT ARE ATTACHED TO A POLE, THERE SHALL BE A CONTINUOUS GROUND WIRE FROM THE METER AND DISCONNECT WHICH MAY RUN INTERNAL TO THE UPRIGHT, THROUGH THE 1/2" FLEXIBLE TUBING IN THE CONCRETE BASE TO THE REQUIRED GROUNDING ELECTRODE(S). THE GROUND WIRE FROM THE POLE GROUNDING LUG, CONTROLLER CABINET AND/OR LUMINAIRE MAY ATTACH TO THIS CONTINUOUS GROUNDING ELECTRODE CONDUCTOR FROM THE SERVICE METER AND DISCONNECT. THE CONTRACTOR SHALL PERFORM A RESISTANCE TO GROUND TEST ON THE CONTINUOUS GROUNDING ELECTRODE CONDUCTOR FROM THE SERVICE METER AND DISCONNECT AND PROVIDE A WRITTEN STATEMENT TO THE AREA ELECTRICAL INSPECTOR THAT THE GROUNDING ELECTRODE CONDUCTOR IS CONTINUOUS FROM THE SERVICE METER AND DISCONNECT AND THE RESISTANCE TO GROUND IS 25 OHMS OR LESS.

12. THE COST OF SIGNAL/SIGN SUPPORTS, INCLUDING ALL HARDWARE, SIGN BRACKETS, FOOTING AND LUMINAIRE ARMS SHALL BE INCLUDED IN THE BID PRICE. THESE COMPONENTS SHALL CONFORM TO ALL APPLICABLE PROVISIONS OF SECTIONS 677, 678, AND 679.
13. HORIZONTAL MEMBERS SHALL BE CAMBERED AND THE VERTICAL POLES BACK RAKED (WHERE APPLICABLE) TO THE ANTICIPATED DEAD LOAD DEFLECTION PLUS THE CAMBER, IF ANY, SPECIFIED ON THE PLANS.
14. AN EQUIVALENT ALTERNATE DESIGN MAY BE SUBSTITUTED FOR THE DETAILS AND MATERIALS SHOWN.
15. THE DETAILS OF DESIGN FOR THE STRUCTURE AND FOOTINGS ARE TO BE SUPPLIED BY THE CONTRACTOR AND/OR BY THE MANUFACTURER. THE STRUCTURE SHALL BE DESIGNED TO RESIST THE MAXIMUM LOADING AS OUTLINED IN THE AASHTO STANDARD SPECIFICATIONS (SEE NOTE 2). ALL DETAILS OF THE STRUCTURE AND THE FOOTING SHALL BE CHECKED AND STAMPED BY A STRUCTURAL ENGINEER REGISTERED IN THE STATE OF VERMONT PRIOR TO SUBMITTAL OF THE SHOP DRAWINGS TO THE ENGINEER.
16. IN ADDITION TO THE SHOP DRAWINGS OUTLINED IN NOTE 10, THE CONTRACTOR SHALL SUBMIT ALL DESIGN CALCULATIONS TO THE TOWN, SHOWING THE FOLLOWING INFORMATION FOR EACH OF THE VERTICAL AND HORIZONTAL COMPONENTS OF THE STRUCTURE AND FOOTING:
 - A. THE DESIGN AXIAL AND SHEAR FORCES AND BENDING AND TORSIONAL MOMENTS.
 - B. THE DESIGN AXIAL, BENDING AND SHEAR STRESSES AND THE COMBINED STRESS RATIO.
 - C. VIBRATION AND FATIGUE CALCULATIONS AS SET FORTH IN SECTION 9 OF THE AASHTO PUBLICATION REFERENCED IN NOTE 2.
 - D. THE ALLOWABLE AXIAL, BENDING, AND SHEAR STRESSES.
 - E. ITEMS A,B,D - SHALL BE SHOWN FOR EACH OF THE GROUP LOADINGS (I, II, III) AND FOR THE BASIC WIND LOAD APPLIED TO THE TWO CASES OUTLINED IN THE AASHTO STANDARD SPECIFICATIONS (SEE NOTE 2) SECTION 1.2.5 (D) (4).
 - F. FAILURE TO SUPPLY THE PROPER DESIGN INFORMATION SHALL BE CAUSE FOR REJECTION OF THE STRUCTURE.
 - G. A MINIMUM OF TWO (2) WEEKS SHALL BE REQUIRED FOR REVIEW BY THE ENGINEER AND TOWN.

17. THE CONTRACTOR/MANUFACTURER SHALL BE RESPONSIBLE FOR COMPLETION OF THE STRUCTURE AND FOOTING DATA ON THE DETAIL SHEET(S).
18. FOR INSTALLATIONS WHERE BOTH "EXISTING" AND "FUTURE" CONDITIONS ARE SHOWN, THE SUPPORTS SHALL BE DESIGNED FOR THE MORE SEVERE OF THE TWO LOADING CONDITIONS. THE INFORMATION OUTLINED IN NOTE 16 ABOVE SHALL BE PROVIDED FOR BOTH THE LOADING CONDITIONS.
19. THE TRAFFIC SIGNALS SHALL BE MOUNTED TO THE ARM OR POLE USING A FIXED MOUNT SYSTEM AS SHOWN ON STANDARD DETAIL E-171C.
20. BASE PLATES SHALL BE STAMPED WITH THE VERTICAL POLE DIAMETER, HEIGHT, YIELD STRENGTH, GAUGE AND THE HORIZONTAL MEMBER DIAMETER, LENGTH, YIELD STRENGTH, GAUGE. ALTERNATELY, THE INFORMATION MAY BE STAMPED ON A METAL TAG RIVETED TO THE POLE NEAR THE HANDHOLE.
21. SEE SHEET 31 & 32 FOR CANTILEVER (MAST ARM) POLE LOCATIONS AND CROSS-SECTIONS.

GENERAL CONSTRUCTION NOTES

SIGNAL EQUIPMENT & INSTALLATION SPECIFICATIONS

1. ALL NEW EQUIP. SHALL MEET OR EXCEED THE TOWN OF WILLISTON PUBLIC WORKS STDS., VAOT SUPPLEMENTAL SPECS. 678 & 752, NEMA STANDARDS AND IMSA OR ITE SPECIFICATIONS, WHERE APPLICABLE. INSTALLATION OF SIGNAL EQUIPMENT SHALL BE AS DETAILED ON THESE PLANS AND THE VAOT STANDARD DETAILS REFERENCED ON SHEET 1 AND IN THE CONTRACT DOCUMENTS.
2. THE CONTRACTOR SHALL SUBMIT, FOR APPROVAL, SHOP DRAWINGS FOR EACH NEW TRAFFIC SIGNAL EQUIPMENT ITEM. SHOP DRAWING SUBMITTALS SHALL CONFORM TO VAOT STD. SPECS.
3. ALL POLE MOUNTED AND MAST ARM MOUNTED SIGNAL HEADS SHALL HAVE POLYCARBONATE SECTIONS AND LENSES. THE SIGNAL HEADS SHALL HAVE FLAT BLACK HOUSINGS AND VISORS. BLACK LOUVERED BACKPLATES SHALL BE INSTALLED ON ALL EAST/WEST HEADS UNLESS OTHERWISE NOTED. ALL SIGNAL HEADS SHALL HAVE RED, YELLOW AND GREEN LED SIGNALS.
4. ALL MAST ARM AND PEDESTAL POLES SHALL BE PAINTED FLAT BLACK.
5. MINIMUM CONDUIT SIZES SHALL BE:
 - A) 2.0 INCHES FOR POWER SERVICE
 - B) 2.0 INCHES FOR SIGNAL WIRING
 - C) 2.0 INCHES FOR STREET LIGHTING
 - D) 1.5 INCHES FOR LOOP LEAD-INS
6. NEW LUMINAIRES SHALL BE GENERAL ELECTRIC M-250A2 250 WATT HPS WITH MC-III CUT-OFF OPTICS, OR EQUAL.
7. PEDESTRIAN SIGNALS SHALL BE EQUIPPED WITH "BIRD CALL" TYPE AUDIBLE SIGNALS. PEDESTRIAN INSTRUCTION SIGNS SHALL BE INCLUDED AT ALL PEDESTRIAN PUSH BUTTON LOCATIONS (SEE DETAIL ON SHEET 32). PEDESTRIAN HEADS SHALL HAVE BLACK HOUSINGS AND FIBEROPTIC SYMBOL (HAND/MAN) TYPE FACES.

LOOP NOTES:

1. EACH LOOP SHALL HAVE ITS OWN AMPLIFIER.
2. ALL LOOPS AND LEAD IN WIRING SHALL BE #12 AWG.

CONTROLLER/CABINET NOTES:

1. THE CONTROLLER SHALL BE AN ECONOLITE ASC-2 TYPE MASTER CONTROLLER PLACED IN A GROUND MOUNTED CABINET AT THE LOCATION SHOWN ON SHEET 31. THE CABINET SHALL HAVE A FLAT BLACK FINISH.
1. THE FIRE PREEMPTION SYSTEM SHALL BE A STROBECOM I SYSTEM, MANUFACTURED BY TOMAR ELECTRONICS, INC., OR EQUAL. THE SYSTEM SHALL INCLUDE ALL NECESSARY INTERFACE BOARDS, WIRING, DETECTORS AND CONFIRMATION LIGHTS. EMITTERS AND OTHER VEHICLE MOUNTED EQUIPMENT TO BE PURCHASED SEPARATELY BY THE TOWN. THE SYSTEM SHALL BE FUNCTIONALLY COMPATIBLE WITH OPTICOM, AS MANUFACTURED BY 3M.
2. THE DWELL PHASE (PHASE 2/6) SHALL BE USED FOR THE START-UP PHASE FOLLOWING FLASHING OPERATION.
3. SIGNAL TIMINGS SHOWN ON THESE PLANS MAY REQUIRE FINE-TUNING IN THE FIELD BASED ON TRAFFIC OBSERVATIONS. FINAL ACCEPTANCE OF THIS PROJECT BY THE TOWN WILL BE SUBJECT TO A 30-DAY TEST PERIOD, DURING WHICH ALL TIMING/PROGRAMMING CHANGES SHALL BE MADE, FOLLOWED BY A 1-YEAR WARRANTY PERIOD DURING WHICH ALL EQUIPMENT PROBLEMS SHALL BE CORRECTED BY THE CONTRACTOR AT NO EXPENSE TO THE OWNER.
4. UPON COMPLETION OF THE 30-DAY TEST PERIOD, THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER AND TOWN UPDATED SIGNAL TIMING PROGRAMMING SHEETS SHOWING ALL MODIFIED SETTINGS, IF ANY.

GENERAL SPECIFICATIONS

1. THE CONTRACTOR SHALL CONTACT ALL UTILITIES BEFORE EXCAVATION TO VERIFY THE LOCATION OF ANY UNDERGROUND LINES. THE CONTRACTOR SHALL NOTIFY "DIGSAFE" AT 1-888-DIG-SAFE PRIOR TO ANY EXCAVATION.
2. INTERSECTION LAYOUT AND UTILITY INFORMATION OBTAINED FROM A SURVEY PERFORMED BY LAMOUREUX & DICKINSON. CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS OF EXISTING UTILITIES AND SHALL BE RESPONSIBLE FOR ANY DAMAGE TO ANY UTILITY, PUBLIC OR PRIVATE, SHOWN HEREON.
3. ANY SURFACES, LINES, OR STRUCTURES WHICH HAVE BEEN DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO THE CONDITION AT LEAST EQUAL TO THAT IN WHICH THEY WERE FOUND IMMEDIATELY PRIOR TO THE BEGINNING OF OPERATIONS.
4. THE DESIGN ON THESE PLANS SHALL BE INSPECTED BY LAMOUREUX & DICKINSON CONSULTING ENGINEERS, INC., ESSEX JUNCTION, VERMONT, TO ENSURE COMPLIANCE WITH THE PLANS AND REQUIREMENTS. LAMOUREUX & DICKINSON WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS THAT MAY ARISE FROM THE FAILURE OF THE CONTRACTOR TO FOLLOW THESE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THAT THE PLANS CONVEY, AND FROM FAILURE TO HAVE BEEN NOTIFIED TO INSPECT THE WORKS AND TESTS IN PROGRESS.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION AND REMOVAL OF STRUCTURES, VEGETATION AND PAVEMENT NECESSARY TO CONSTRUCT THE PROJECT, UNLESS OTHERWISE NOTED ON THE PLANS. THE CONTRACTOR SHALL REMOVE ALL EXCESS MATERIAL, DEBRIS AND TRASH FROM THE SITE UPON COMPLETION OF CONSTRUCTION, UNLESS OTHERWISE DIRECTED BY THE TOWN.

CONTRACT PLANS

**VERMONT AGENCY OF
TRANSPORTATION**

**WILLISTON NHG 5500 (10)S
"TAFT CORNERS"
(US ROUTE 2 / VT ROUTE 2A)**

WILLISTON	VERMONT
CANTILEVER SUPPORT & TRAFFIC SIGNAL NOTES	
	design RJD/JLC drawn JLC checked RJD
LAMOUREUX & DICKINSON Consulting Engineers Inc. 14 Morse Drive Essex Junction, VT 05452 (802) 878-4450 Engineers-Planners-Surveyors	
scale 1"=20' sht. no. 34	