

**EXHIBIT A  
MIDDLESEX COUNTY  
OFFICE OF THE COUNTY ENGINEER  
STANDARDS AND REQUIREMENTS FOR  
DEVELOPER DESIGNED MODIFIED AND CONSTRUCTED  
TRAFFIC SIGNALS**

**1. GENERAL REQUIREMENTS**

**A. Standards**

Roadway design shall conform to the latest AASHTO (and interim's) as modified by N.J.D.O.T. Design Manuals and the Revised ADA Regulation implementing Title II and 2010 ADA Standards for Accessible Design. Traffic signal design shall also conform to the latest current Manual on Uniform Traffic Control Devices and the N.J.D.O.T., Traffic Bureau and Electrical Bureau current requirements and the Revised ADA Regulation implementing Title II and 2010 ADA Standards for Accessible Design and the July 26, 2011 PROWAG.

All electrical materials used for the installation or modification of a traffic signal shall be in conformance with the current approved electrical material list from the New Jersey Department of Transportation.

The final traffic signal and electrical plan shall be done on the current release of AutoCAD or Intergraph Microstation which conforms with the current State requirements and submitted on CD-R or DVD-R to the County.

The symbols to be used shall be in accordance with the "Standard Legend - New Jersey Department of Transportation", or as approved by the County.

At a minimum the intersection shall be milled and resurfaced, curb to curb, to the limit of the areas of detection.

- a. Intersection shall be fully actuated using video detection.
- b. Left turn slots shall be provided on all approaches and have separate detection area for protected or permissive left turn movement.
- c. Left turn slots shall have either protected or protected/permitted phasing.
- d. Left turn slots on physically divided roadways shall operate in the protected mode only.
- e. All signal heads shall be 12 inches and shall be installed with State approved LEDs.
- f. Pedestrian push button incorporating accessible pedestrian signals, walk/don't walk pedestrian signal heads with countdown timers shall be installed at all intersections for all pedestrian movements.
- g. Separate vehicle and pedestrian activation phase shall be provided.
- h. Provide sufficient lane width for shared vehicle/bicycle lane.
- i. Use soft recall, major street, Don't Walk.
- j. Use 3 second delay for the major street left turn slot.
- k. Use 5 second delay for side street if Right on Red is allowed.
- l. Background cycles, is used, shall be during the a.m. & p.m. peak hours. Signal will operate in the free mode all other times.
- m. "Walk" time shall be the same time as the calculated "Flashing Don't Walk" time for the pedestrian phase.

- n. Right turn ramps shall be signalized.
- o. Pavement stripes and markings shall be Thermoplastic, Long Life.
- p. Raise pavement markers shall be installed. Show on the Striping Plan, not Traffic Signal Plan.
- q. Regulatory and warning signs shall be installed as per current MUTCD requirements.
- r. Traffic Counts shall be taken within 4 months of submittal.
- s. Install mast arm street name signs.
- t. Signage for parking restrictions shall not be shown on Traffic Signal Plan.
- u. Use 8 sec. min. green for Main Road and 6 second min. green for side streets.
- v. Provide a table of MUTCD signs used.
- w. All sign material shall be Type XI.
- x. All signal heads shall be equipped with backplates with a yellow retroreflective strip on the outside border.
- y. Traffic signal shall be equipped with communication infrastructure and integrated into the County's Advanced Traffic Management System (ATMS).
- z. Vehicle and pedestrian detection shall be designed to collect necessary data to support Advanced Traffic Signal Performance Measures (ATSPMs) as part of the County's ATMS.

### PROCEDURES

#### **B. Concept/Preliminary Traffic Signal Plan & Traffic Report**

- a. Provide warrant analysis in accordance with the requirements of the current MUTCD to obtain an Authorization to Design a new traffic signal.
- b. Traffic volumes for the A.M. and P.M. peak hours Weekday shall be provided. Weekend counts may also be provided as appropriate.
- c. Mainline control baseline with stationing
- d. Pavement widths/lane widths
- e. Existing and proposed right-of-way lines as appropriate
- f. Lane configuration
- g. Proposed signal layout
- h. Timing and phasing schedules on separate sheet
- i. Curbs, Sidewalks & Driveways
- j. Capacity Analysis Report using the Highway Capacity Software (HCS) for A.M. and P.M. existing and proposed peak hours weekdays/weekends as appropriate for the current volumes and projected volumes.
- k. The minimum Level of Service of "C" shall be provided for each County road approach leg/turning movement based upon a HCS analysis.
- l. Calculate the average and 95% queue length for each approach lane for both existing and proposed conditions.
- m. Provide sufficient storage at a minimum based upon the larger of average queue length for left, right and through lanes.
- n. Provide computer animated simulation for the existing and proposed conditions.
- o. ADA compliant curb ramps and turning spaces shall be installed for all pedestrian movements during the course of the alterations to the street and traffic signal. The ADA compliant curb ramps and turning spaces shall be installed both on-site and off-site within the project limits.
- p. Curb ramps and turning spaces shall comply with the Revised ADA Regulations implementing Title II and 2010 ADA Standards for Accessible Design and July 26, 2011 PROWAG.
- q. Provide a minimum 5-foot wide concrete sidewalk between the curb ramps and turning spaces to provide for the pedestrian access route.
- r. Provide the proper turning radius for WB-65/WB-67 design vehicle.
- s. Provide 5-foot wide concrete sidewalk, reinforced, 4" thick.
- t. Provide calculations for yellow change and red clearance based upon ITE formulas.
- u. All projects with existing traffic signals that have pedestrian push buttons and/or vehicle detection will have active pedestrian push buttons and/or an active system of vehicle detection throughout the project construction duration. The signal will not be fixed mode.

- v. "When "No Turn on Red" signs are used, in addition to the near right they should be placed on the far right and should be installed near the appropriate signal head".
- w. Traffic Signal Standards and controller should not be located near the curve of a corner with a radius of less than 15 feet, or; a corner with a radius of less than 30 feet provided where trucks and buses turn right occasionally, or; a corner with a radius of less than 50 feet provided where large truck combinations and buses frequently turn right.
- x. Provide Adaptive Traffic Signal timing parameters and schedules along corridors designated by the County for Adaptive control.

**C. Final Traffic Signal Plan**

A traffic signal plan shall be prepared for the submission to the County/NJDOT if necessary, for the intersection based on the selected concept and shall include, but not be limited to the following:

- Geometric improvements
- Proposed signal layout, area of detection, signing and striping
- Signal phasing schedule
- Signal and sign legends
- Proposed traffic regulations
- Proposed signal timings (submitted on separate 8-1/2" x 11" sheet)
- A CD copy of the computer animated simulation data for County use and dissemination.
- The AM/PM traffic peak hour turning counts.

The traffic signal plan shall be kept clean of information unrelated to the traffic signal. There shall not be any difference in the line density and line weight and lettering sizes and lettering type between existing and proposed conditions on the traffic signal plan. The standards set forth above shall be followed in the preparation of the traffic signal plan.

**D. Electrical Plan/Details/Construction**

The electrical plan for the intersection shall be prepared for submission to the County and the N.J.D.O.T., if necessary for approval. The State and the County may require the electrical plan to be submitted on disk in the State's Format.

- A waterproof splice kit shall be used for all splices and rated for the voltage that is supplied.
- Provide conduit fill calculations per NEMA Requirements.
- Ground wire (#8 AWG, insulated, colored green) shall be continuous throughout the traffic signal system and secured to all ground rods, cabinets at traffic signal basis.
- Provide State EE numbers for all electrical items.
- Use video detection with color cameras. No coaxial cable allowed.
- "K" poles shall be used for all mast arms mounted with video detection cameras.
- "T" poles shall be used in lieu of pedestrian standards when signal heads are mounted over eight-feet.
- Serial GPS for Cobalt, ASC/3 Controller or ASC/2M Master.
- Provide a cabinet lock with the County standard lock, PELCO No. 9R-4B773.
- Provide uninterruptible power supply (UPS) for the traffic control signal. The UPS shall be designed to be capable to last four (4) hours of continuing full operation and an additional 24 hours of flash mode.
- The designer is responsible for locating and identifying on a plan the horizontal and vertical clearances of the utility company's primary (750 volts or more) and secondary power lines and assure that the minimum clearances are in accordance with the NEW JERSEY ADMINISTRATIVE CODE CHAPTER 25 UTILITY ACCOMMODATION, Section 16:25-5.3 (b). The designer coordinates the electrical design work with the present and future plans of the utility companies. All overhead and underground utilities must be shown on the plans. There shall be no conflicts with the lighting and traffic signal installation.

- Provide elevations for all JB's and FND's.
- All electrical equipment shall be new.
- Traffic signal preemption requested by the Municipality shall be installed in a separate cabinet.
- Indicator Light. Install a red LED light (0.75" - 1.50" in diameter) on the exterior of the controller cabinet to indicate the battery back-up is in use and loss of A.C. cabinet power. Illuminate indicator light when the battery back-up system is providing power to run the intersection. Turn off the light during normal A.C. power operation. Install the light at a point easily visible from a vehicle traveling on the main arterial of the intersection. Provide watertight seal.
- Provide 30-Amp inlet for backup generator connection.
- Provide communication infrastructure for the traffic control signal to communicate with, and be integrated into, the County's Advanced Traffic Management System. The communication system should be designed to at a minimum support remote connections to the traffic signal controller, conflict monitor/malfunction management unit, vehicle detection, pedestrian detection, Uninterruptable Power Supply (UPS), and Emergency Vehicle Preemption (EVP) (where applicable).

**E. Permission to Design/Construct**

See N.J.A.C. 16:27-4.1-5 for the Traffic Regulations and Standards for Traffic Control Devices.

The following paragraph is required as part of the Engineer's Certification over the professional engineer's seal to receive Authorization to Design from the County:

**Design:**

I hereby certify that the above intersection is warranted for a traffic signal in accordance with the requirement set forth in the current "Manual on Uniform Traffic Control Devices for Streets & Highways".

The following paragraph is required as part of the Engineer's Certification over the professional engineer's seal to receive Record Design Plan Acceptance (RDPA) from the County:

**Record Design Plan:**

I hereby certify that the above plan and timings have been designed in accordance with the requirements set forth in the current "Manual of Uniform Traffic Control Devices for Streets and Highways".

The Record Design Plan is acceptable for construction in accordance with the Engineer's Certification. Any modification should immediately be brought to the attention of the County.

Plans and timings submitted without the engineer's certification will not be reviewed.

**F. Maintenance of a Modified and/or New Traffic Signal System**

The contractor/developer is responsible for maintenance and operation of the newly installed traffic signal system until approval of installation by the County and/or State. This includes but is not limited to the following items: poles, mast arms, pedestals, traffic signal heads and lamps, wire, overhead wiring, foundation, conduit, detectors, controllers and timing sequences, associated highway lighting units and electric services. The maintenance responsibility for existing signals shall be from the time the contractor first alters the existing traffic signal, in any manner until approval of installation by the County and/or State. Should the contractor's forces cause any damage to any signal system, installed as part of the contract, or should any portion of the signal system fail or malfunction for any reason, it shall be the contractor's responsibility to effect immediate repairs and return the signal to normal operation. The contractor shall also, bear the risk of loss or damage to the signal system arising due to third person or persons, vehicular accidents, vandalism, or from any other cause until approval of Installation by the County and/or State.

The contractor shall promptly repair, replace, and make good any such damage or loss at no additional expense to the County. Work shall begin to repair the signal system within a maximum of two hours after the damage is caused or after he is notified of damage or a malfunction. Workmen assigned to such repair shall work continuously until the signal resumes normal operation.

**F. Maintenance of a Modified and/or New Traffic Signal System (Cont'd)**

In addition, if the Contractor fails to respond to a failure or knockdown within two hours after notification, or does not begin work within the two hours limit specified, or does not continue to work until the traffic signal is back into normal signal operation, in the interest of safety, the County may respond with its own forces to restore normal signal operation. If the County responds with its own forces to affect repair at the intersection(s), the Developer/Contractor agrees to pay the County a sum of \$7,500 for costs of mobilizing its forces and equipment. In addition, the Contractor shall pay the County its labor costs, actual cost of material used to affect the repair, and shall pay the actual cost of traffic protection to the agency providing the police, subcontractors, etc. Any such emergency work performed by County forces will not in any way diminish the Developers/Contractor's liabilities as described hereunder.

All materials, labor, equipment, fees, energy costs and all else necessary for the contractor to maintain the signal in operation shall be at his own expense.

Prior to the start of installation or modification of the traffic signal, the State's, County's and or Municipality's representatives as appropriate shall be given the names and telephone numbers of the person or persons to be contacted should a failure or damage occur. These persons shall be a licensed electrical contractor having a license to do business in the State of New Jersey and familiarity with traffic signal construction and operation. The developer/contractor agrees to be fully liable for the operation of the traffic signal for the term of the contract until NJDOT's/County approval is granted and agrees to defend, indemnify and otherwise save harmless the governmental agency, its departments, bureaus, boards, officials, and employees from any and all claims, demands, suits, recoveries, judgments or actions at law, whether for personal injury, property damage or liabilities of any other kind, including the cost of defense which arise from acts or omissions whether negligent or not of the contractor, or his agents, employees, servants, subcontractors, material men or others working for the contractor in the construction and/or maintenance of the traffic signal installation(s) at his own expense.

**G. Signal Plan Revisions**

The Developer shall seek County permission prior to making any revisions to any item to the authorized electrical plan, traffic signal layout, timing, phasing, geometry, signing, and striping. Included with the Developers written request for revision will be his Engineers Certification over the professional engineer's seal that the revisions have been have been designed in accordance with the requirements set forth in the current MUTCD and the Revised ADA Regulation implementing Title II and the 2010 ADA Standards for Accessible Design.

**H. As-Built Plans/NJDOT Approval**

See N.J.A.C. 16:27-4.6 for the Traffic Regulation and Standards for Traffic Control Devices.

The Consultant/Developer shall seek County written approval prior to making any revisions to any item to the authorized electrical plan, traffic signal layout, timing, phasing, geometry, signing, and striping. Included with the Consultant/Developer written request for revision will be his signed Engineers Certification with the professional engineer's seal that the Traffic Signalization Plan and the signal timing schedule revisions have been designed in accordance with the requirements set forth in the current MUTCD and meet all applicable N.J.S.A. 39:4 requirements.

Prior to activating the traffic signals, the Consultant/Developer shall inspect the traffic signal. The Consultant shall inspect the traffic signal for compliance with the authorized traffic signal plan and for ADA compliance. Within 24 hours of activation the Consultant shall provide to the County a certification signed and sealed by a N.J. Licensed Engineer certifying the traffic signal has been constructed in accordance with the Authorized Traffic Signal Plan and any modifications are in accordance with the current MUTCD and are in compliance with the current ADA. The Consultant/Developer shall schedule a field inspection with the County's Office of Public Works to test the battery back-up and generator inlet for proper operation. Police should be onsite during the test. The consultant shall provide a final Traffic Signal Plan mylar and print out of the traffic signal timing to the County for submission to the County/State for approval within 10 calendar days of activation. The Consultant/Developer shall also fill out the provided checklists of ADA requirements showing full ADA compliance to the County. The County will perform its own inspection upon receipt of the Consultant/Developer Certification.

The traffic signal and timing plan and electrical plan will be submitted to the County/State for "Approval of Installation" by the County. The As-Built Plan mylar and disk format shall be in accordance with the above standards. Checklists of ADA requirements showing full ADA compliance will also be submitted to the County for the "Approval of Installation". The following paragraph is required in the Engineer's Certification letter sealed with the professional engineer's seal for a signal constructed in complete conformance with the County/State authorized Traffic Signal Plan.

I hereby certify that the installation has been inspected on (insert date) and completed in accordance with the As-Built Plan LTS (insert #) dated (insert date and As-Built Timing Plan dated (insert date). I hereby certify that the as-built traffic signal installation is in accordance with the requirements set forth in the current "Manual on Uniform Traffic Control Devices for Streets and Highways".

**I. Re-evaluation of State Approved Timing**

After a period of 3 to 6 months from when the County and/or State has approved the traffic signal installation the Developer will take traffic counts in the a.m. and p.m. peak periods. These counts will be used to compare projected volumes with actual volumes and analyze the efficiency of the State approved traffic signal timing. The signal timing will be revised if necessary by the Developer. The County would then submit the revised signal timing to the County and/or State for approval.

## 2. SITE PLAN RESOLUTION/AGREEMENT CONDITIONS

### MAINTENANCE/JURISDICTION

Upon completion of construction and acceptance by County and/or NJDOT of the traffic signal and equipment, the County, Municipality, and Developer, shall accept and retain jurisdiction of their respective portions of the improvement and maintain them in a manner satisfactory to the County and State. The County shall be responsible for the operation and maintenance of the traffic signal installation in accordance with the Municipal/Developers agreement. This includes signing, striping, and above and below ground traffic signal equipment. All warranties and guarantees associated with items of work will be transferred to the County upon acceptance of maintenance and prior to release of guarantees or bonds including a one-year maintenance bond. The electrical costs for the traffic signal and street lighting will be the responsibility of the Municipality/Developer/Property Owner.

The MUNICIPALITY and DEVELOPER/PROPERTY OWNER shall maintain their respective roadway pavement in a condition sufficient to accept the detection equipment associated with the traffic signal system. The MUNICIPALITY and DEVELOPER/PROPERTY OWNER shall affect pavement repairs as necessary or within two months of written notice, which notice shall be served upon the Clerk of the MUNICIPALITY and DEVELOPER/PROPERTY OWNER. If the pavement is not repaired or replaced, the COUNTY reserves the right to terminate the Agreement and/or, upon thirty day written notice, to perform the roadway pavement work. The MUNICIPALITY and DEVELOPER/PROPERTY OWNER shall be responsible for all costs incurred by the COUNTY in the performance of this roadway pavement work in their portions. If Developer/Property Owner/Municipality fails to perform pavement repair or reimburse repair cost to the County, the County will seek legal means to resolve the dispute.

## 3. ADA CHECK LIST

ADA Checklist Document 1 for Curb Ramp (if applicable)

ADA Checklist Document 2 for Traffic Control Signals

ADA Checklist Document 3 for New and Existing Sidewalks (Pedestrian Access Routes) Along roadways within Project Limits (if applicable)

## 4. AS-BUILTS/GIS DOCUMENTATION

- a. County to receive AutoCAD drawing files (.dwg) for all drawings delivered within the final project deliverable package.
- b. All AutoCAD files must be drawn with the following spatial reference information:
  - i. Vertical:
    - NAVD\_1988\_Foot\_US
    - WKID: 105703 Authority: ESRI
    - Linear Units: Foot\_US
    - Direction: positive up
    - Vertical Shift: 0.0
    - Vertical Datum: North\_American\_Vertical\_Datum\_1988
  - ii. Horizontal:
    - Projected Coordinate System Name:
    - NAD\_1983\_2011\_StatePlane\_NewJersey\_FIPS\_2900\_Ft\_US
    - Projection: Transverse Mercator
    - False\_Easting: 492125.00000000
    - False\_Northing: 0
    - Central\_Meridian: -74.50000000
    - Latitude\_of\_Origin: 38.83333333
    - Linear Unit: Foot\_US
    - Geographic Coordinate System Name:
    - GCS\_NAD\_1983\_2011
    - Angular Unit: Degree
    - Prime Meridian: Greenwich
    - Datum: D\_NAD\_1983\_2011
    - Spheroid: GRS\_1980
    - Semimajor Axis: 6378137
    - Semiminor Axis: 6356752.314140356
    - Inverse Flattening: 298.257222101

#### 4. AS-BUILTS/GIS DOCUMENTATION (Cont'd)

- c. Coordinates needed for all features in the Construction section of the final submittal package.
  - i. Features include:
    1. Inlets
    2. Traffic Signals
    3. Water Valves
    4. Stormwater Detention/Retention Ponds
    5. Manholes
    6. Drainage Chambers
    7. Water Quality Structures
    8. Hydrants
    9. Drainage Outfalls
    10. Other Drainage Structures
    11. End Section (beginning and end coordinate points)
    12. Walls (beginning, end, and angle coordinate points)
    13. Guiderails (beginning and end coordinate points)
    14. Fencing (beginning, end, and angle coordinate points)
    15. Bridges (center, beginning and end)
    16. Culverts (beginning and end)
    17. Property Monument Markers
    18. Signs
    19. Buildings (one coordinate for each corner of the building footprint)
    20. ADA ramps with DWS Marking
    21. Rights of Way
    22. Centerlines
    23. Station Points
    24. Sidewalks
    25. Curbs (beginning, end, and minimum 3 points at each curve – one at the start, center, and end of curve)
    26. Gates (beginning and end point)
- d. Asset Inventory
  - i. Collected Attribute Descriptions stored in Drawing
    1. Inlets - Type, NJDEP Litter Grate Compliance, Bicycle Grate Compliance, Elevation, Inspection Date, Municipality
    2. Traffic Signals - Pole Type, Pole Material, Assembly Count, Municipality, Elevation, Inspection Date
    3. Water Valves – Valve Type, Water Type, Municipality, Elevation, Inspection Date
    4. Stormwater Detention/Retention Ponds – Pond Type, Area in SQ FT, Perimeter size in FT, Vegetation Type, Municipality, Center Elevation, Inspection Date
    5. Manholes – Type, General Location, Diameter, Manhole Depth, Owner, Condition, Municipality, Elevation, Inspection Date
    6. Drainage Chambers - Type, General Location, Diameter, Material, Elevation, Elevation, Inspection Date, Municipality
    7. Water Quality Structures – Structure Type, Structure Material, Structure Function, General Location, Elevation, Inspection Date, Municipality
    8. Hydrants – Type, Operation Status, Flow Rate, Location, Municipality, Elevation, Inspection Date
    9. Drainage Outfalls – Type, Location, Diameter, Material, Elevation, Inspection Date, Municipality
    10. Other Drainage Structures - Type, Location, Diameter, Material, Elevation, Inspection Date, Municipality
    11. End Section - Type, Elevation, Pipe Material, Pipe Diameter, Location, Inspection Date, Municipality
    12. Walls – Wall Type, Wall Material, Peak Wall Height, Wall Thickness, Wall Length in FT, General Location, Elevation, Inspection Date, Municipality
    13. Guiderails – Type, Material, Condition, Length in FT, Road Location, Road Name, Owner, Municipality, Elevation, Inspection Date
    14. Fencing – Type, Material, Height in FT, Length in FT, General Location, Installation Date, Owner, Inspection Date, Elevation, Municipality
    15. Bridges – Name, Type, Material, Year Built, Maintained By, Height in FT, Length in FT, Road Location, Municipality, Elevation, Inspection Date
    16. Culverts – Type, Material, Diameter, Length in FT, Road Location, Maintained By, Elevation, Inspection Date, Municipality

---

**4. AS-BUILTS/GIS DOCUMENTATION (Cont'd)**

17. Property Monument Markers – Material, General Location, Elevation, Monument Face Details, Owner, Municipality, Inspection Date
18. Signs – Municipality, MUTCD Designation, Sign Text, Support Type, Sign Condition, Road Location, Elevation, Inspection Date
19. Buildings – Name, Footprint SQ FT, Address, City, State, ZIP, Municipality, Owner, Ownership Status, Floor Levels, Year Built, Total SQ FT, Elevation, Inspection Date
20. ADA Ramps with DWS - Pavement Location, Municipality, County, UDOT Region, Street Name, Elevation, Inspection Date
21. Rights of Way – Municipality, ROW Type, Owner, Street Name
22. Centerlines - Construction Project Name, Date Drawn
23. Station Points – Measurement in FT at that station point
24. Sidewalks – Material, Width in FT
25. Curbs – Elevation, Curb Type
26. Gates – Gate Type, Length in FT, Height in FT, Material