MEMORANDUM

Agenda Item No. 8(N)(3)

TO:	Honorable Chairman Oliver G. Gilbert, III and Members, Board of County Commissioners	**DATE:**	October 16, 2024
FROM:	Geri Bonzon-Keenan County Attorney	**SUBJECT:**	Resolution authorizing award of a bid waiver contract pursuant to section 5.03(d) of the Home Rule Charter and section 2-8.1 of the Code by a two-thirds vote of the Board members present; authorizing award of Contract No. BW-10523 to Horsepower Electric, Inc. in a total amount not to exceed $199,919,376.66 for a ten-year term for the completion of the Advanced Traffic Management System (ATMS) project for the Department of Transportation and Public Works; and authorizing the County Mayor to execute same for and on behalf of Miami-Dade County and exercise all provisions of the contract, including any cancellation, renewal or extensions, pursuant to section 2-8.1 of the Code and Implementing Order 3-38

The accompanying resolution was prepared by the Transportation and Public Works Department and placed on the agenda at the request of Co-Prime Sponsors Commissioner Juan Carlos Bermudez and Commissioner Kevin Marino Cabrera.

for
Geri Bonzon-Keenan
County Attorney

GBK/uw

Memorandum

Date: October 16, 2024

To: Honorable Chairman Oliver G. Gilbert, III
and Members, Board of County Commissioners

From: Daniella Levine Cava
Mayor

Subject: Recommendation to Award a Bid Waiver Contract for the Advanced Traffic Management System

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Executive Summary

This item is in response to Resolution No. R-223-24, sponsored by Commissioner Kevin Marino Cabrera. The resolution directed the Administration to immediately terminate the Advanced Traffic Management System (ATMS) contract with Yunex LLC (Yunex Traffic), *Contract No. RFP-01058*, for cause, negotiate a completion ATMS contract with the second lowest, responsive, and responsible bidder, Horsepower Electric, Inc. (HPE), and present a recommendation to the Board as to whether the County should enter into such completion contract. Accordingly, this item sets forth the Administration's recommendation to award a 10-year bid waiver contract to HPE for a value of $199,919,376.66 and outlines the parameters of the ATMS contract for the Department of Transportation and Public Works (DTPW).

Under the contract, HPE is responsible for (a) upgrading the existing ATMS and traffic controllers; this consists of ensuring the signalized intersections are equipped with Caltrans Model 2070LX controllers and local controller software; a minimum of 500 intersections per year shall be upgraded; (b) actuating signalized intersections; this includes the engineering and construction work required for adding vehicular, bicycle, and pedestrian detection at signalized intersections; and (c) delivering engineering services to develop and integrate additional traffic signal operational functions; this task supports traffic response and adaptive signal control operations. More specifically, this contract will:

1) Continue to upgrade the County's existing traffic signals: Prior to contract termination in April 2024, Yunex Traffic had deployed 788 intersection control systems (2070LX controller) along with implementing central and local software. Approximately 1,874 intersections have outdated control systems (McCain D170E controller), which will be upgraded to the 2070LX controller under this contract. HPE will utilize any systems purchased through Yunex Traffic but not deployed and re-utilize the 2070LX controllers, where possible, by means of a local software update or replacement of the Controller1C Module.
2) Make changes, corrections, and modifications to work initiated by Yunex Traffic: Prior to termination, Yunex Traffic initiated the installation of new vehicle detection systems at 100 intersections; however, only two locations passed final inspection.
3) Incorporate additional work required due to updates and revisions to applicable laws, codes, and specifications since the initial solicitation in 2018.

This contract is intended to result in the delivery of a complete, functional, and intelligent traffic management system. To facilitate that, HPE will adhere to a phased approach to the design, development, and implementation of ATMS, with successful performance ultimately effectuating the County's Signal Innovation Program, having smart technology maximize safety across various transit modes.

Recommendation

It is recommended that the Board waive competitive bidding procedures pursuant to Section 5.03(D) of the Home Rule Charter and Section 2-8.1(b)(1) of the Miami-Dade County Code (Code), by a two-thirds vote of the Board members present, and award a bid waiver contract, *Contract No. BW-10523*, *Advanced Traffic Management System*, to HPE in the amount of $199,919,376.66 for a 10-year term

for DTPW. This contract replaces *Contract No. 01058* approved by the Board via Resolution No. R-528-20 on May 19, 2020 in the amount of $160,173,671.

Background

DTPW operates and maintains over 3,000 signalized intersections on State of Florida and local roads within the County's geographical boundaries. DTPW monitors and manages the intersections from the Traffic Management Center. Through the deployment of state-of-the-art sensing, communications, and data processing technologies, ATMS provides solutions to alleviate congestion and promote safety by adapting to traffic conditions occurring on urban freeways and surface streets. ATMS capitalizes on information that can be provided by roadside traffic sensors to develop optimal traffic control strategies, addressing traffic needs in real time.

Approximately 1,874 intersections are controlled using the McCain D170E controller, which will be upgraded to the 2070LX controller under this contract. The 2070LX controller is a rugged, multi-tasking field processor and communications system configurable for a variety of traffic management applications. In addition to upgrading the McCain D170E controllers, this contract will also modify existing 2070LX controllers through the replacement of the 1C Controller Module or updated local controller software so that there is a consistent and standardized platform at all traffic signals. There are currently 1,074 intersections being operated with 2070LX controllers (286 Econolite and 788 Yunex Traffic) within the County.

Approval of a bid waiver in lieu of a competitive process is requested due to the County's traffic management efforts and innovations since implementing the coordination and synchronization of traffic signals in the mid-1970s, combined with the growth and development of diverse and unique areas within the County, yielding a complex and sophisticated traffic system. The mixture of urban, suburban, and rural areas necessitates flexibility in the project approach, precluding an off-the-shelf solution from a single source for the County's traffic management system. In 1976, the County began utilizing the Urban Traffic Control System (UTCS). In 2005, the Board approved a contract with Kimley Horn and Associates (KHA) to utilize their KITS® ATMS software, replacing the obsolete UTCS. Since then, the County has undertaken deliberate efforts to modernize the traffic signal system and implement a traffic signal infrastructure capable of integrating and supporting emerging technologies (e.g., adaptive controls, AI tools, and autonomous vehicles). In recent years, market research and field deployments of fully integrated ATMS systems – Econolite's Centracs Software (*Contract No. BW9872-1/20*) and Yunex Traffic's Tactics Software (*Contract No. 01058*) – revealed that package systems are not capable of meeting the demands of existing County traffic functions and operations without extensive redevelopment, which would significantly delay implementation.

Under Resolution No. R-1099-21, the County awarded *Contract No. L-10134* to KHA for the maintenance of the legacy KITS® ATMS, to be effective until the transition to a new ATMS. The contract also provided for a KITS® ATMS software update. As part of the maintenance effort, it was discovered that the updated KITS® software included features not available with Econolite's or Yunex's software, and that it was capable of seamlessly integrating with controllers from different manufacturers. Currently, the current KITS® software is the only system monitoring all traffic signals within the County. The proposed contract does contain an option that may be exercised by the County in the future to implement Econolite's cloud-based software solution.

Following Board direction to streamline efforts and promote efficiencies to complete the ATMS project, the Administration deems it is in the County's best interest to award this bid waiver contract to HPE pursuant to Section 5.03(D) of the Home Rule Charter and Section 2-8.1(b)(1) of the Code. Through this contract, the County will continue to use and implement advanced features of the KITS® software to upgrade traffic signals, facilitating on-time project completion.

Scope
The scope of this item is countywide in nature.

Fiscal Impact/Funding Source
The fiscal impact for the 10-year term is $199,919,376.66. This amount includes a 10% contingency fee of $18,174,488.79 for unforeseen work. The 10-year term for this contract is based on a project schedule that considers the real time need to engineer and design the system implementation requirements, install and test the purchased equipment, and the engineering and construction work necessary for including additional vehicle and pedestrian detection systems. This contract is funded through the following funding sources:

Program	Adopted Budget	Funding Sources
608400 Advanced Traffic Management System (ATMS) – Phase 3	FY24-25 Adopted Budget & Multi-Year Capital Plan; Volume 2, Page 174	Mobility Impact Fee FDOT - County Incentive Grant Program

Track Record/Monitor
The County is supervising, monitoring, and inspecting all aspects of the ATMS's implementation, deployment, and administration. Mr. Frank Aira, P.E., Chief, Traffic Signals & Signs Division, DTPW, is responsible for this project.

Delegated Authority
If this item is approved, the County Mayor or County Mayor's designee will have the authority to exercise all provisions of the contract, including any cancellation, renewal or extension provisions, pursuant to Section 2-8.1 of the Code and Implementing Order 3-38.

Vendor Recommended for Award
Pursuant to Resolution No. R-477-18, the recommended vendor HPE is a local vendor.

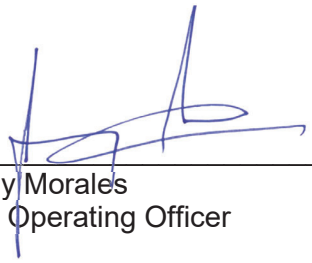
Vendor	Principal Address	Local Address	Number of Employee Residents 1) Miami-Dade 2) Percentage*	Principal
Horsepower Electric, Inc.	8105 West 20 Ave Hialeah, FL 33014	8105 West 20 Ave Hialeah, FL 33014	1) 95 2) 90 %	Michael Martinez

*Provided pursuant to Resolution No. R-1011-15. Percentage of employee residents is the percentage of vendor's employees who reside in Miami-Dade County as compared to the vendor's total workforce.

Due Diligence
Pursuant to Resolution No. R-187-12, due diligence was conducted in accordance with SPD's Procurement Guidelines to determine contractor responsibility, including verifying corporate status and that there are no performance or compliance issues through various vendor responsibility lists and a keyword internet search. The lists that were referenced included convicted vendors, debarred vendors, delinquent contractors, suspended vendors, and federal excluded parties. There were no adverse findings relating to contractor responsibility.

Applicable Ordinances and Contract Measures

- The two percent User Access Program provision does not apply.
- Small Business Program contract measures, including Local Preference, do not apply as this is a bid waiver award.
- The Living Wage Ordinance does not apply.



Jimmy Morales
Chief Operating Officer

Memorandum

MIAMI-DADE COUNTY

Date: October 2, 2024

To: Eugene Love, Agenda Coordinator

From: Eulois Cleckley, Director
Department of Transportation and Public Works

Subject: Request to Process Late Departmental Agenda Item

I am requesting that the recommendation to Award a Bid Waiver Contract for the Advanced Traffic Management System (ATMS), *Contract No. BW-10523*, be placed on the agenda for the October 2024 Committee Cycle.

Although this item has not met the noticed deadline and has been provided to the Agenda Coordination Office late, the Administration has been directed by commission district offices to place this item on an October Committee.

Therefore, please process the item notwithstanding that the 3-Day Rule may be applicable to it. I am aware that this item is subject to approval for placement on the agenda by the appropriate committee chairperson as well as the BCC Chairman, and review by the Office of the County Attorney.

Approved by Mayor or Mayor's Designee

Jimmy Morales
Print Name

Approved by Policy Director or Designee

Nicole Tallman
Print Name

cc: Geri Bonzon-Keenan, County Attorneys
CAOagenda@miamidade.gov

MEMORANDUM
(Revised)

TO: Honorable Chairman Oliver G. Gilbert, III
and Members, Board of County Commissioners

DATE: October 16, 2024

FROM: Geri Bonzon-Keenan
County Attorney

SUBJECT: Agenda Item No. 8(N)(3)

Please note any items checked.

_____	**"3-Day Rule" for committees applicable if raised**
_____	**6 weeks required between first reading and public hearing**
_____	**4 weeks notification to municipal officials required prior to public hearing**
_____	**Decreases revenues or increases expenditures without balancing budget**
_____	**Budget required**
_____	**Statement of fiscal impact required**
_____	**Statement of social equity required**
_____	**Ordinance creating a new board requires detailed County Mayor's report for public hearing**
_____	**No committee review**
✓	**Applicable legislation requires more than a majority vote (i.e., 2/3's present ✓, 2/3 membership ____, 3/5's ____, unanimous ____, majority plus one ____, CDMP 7 vote requirement per 2-116.1(3)(h) or (4)(c) ____, CDMP 2/3 vote requirement per 2-116.1(3) (h) or (4)(c) ____, CDMP 9 vote requirement per 2-116.1(4)(c) (2) _____) to approve**
_____	**Current information regarding funding source, index code and available balance, and available capacity (if debt is contemplated) required**

Approved _____ Mayor
Veto _____
Override _____

Agenda Item No. 8(N)(3)
10-16-24

RESOLUTION NO. _____

RESOLUTION AUTHORIZING AWARD OF A BID WAIVER CONTRACT PURSUANT TO SECTION 5.03(D) OF THE HOME RULE CHARTER AND SECTION 2-8.1 OF THE CODE OF MIAMI-DADE COUNTY BY A TWO-THIRDS VOTE OF THE BOARD MEMBERS PRESENT; AUTHORIZING AWARD OF CONTRACT NO. BW-10523 TO HORSEPOWER ELECTRIC, INC. IN A TOTAL AMOUNT NOT TO EXCEED $199,919,376.66 FOR A TEN-YEAR TERM FOR THE COMPLETION OF THE ADVANCED TRAFFIC MANAGEMENT SYSTEM (ATMS) PROJECT FOR THE DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS; AND AUTHORIZING THE COUNTY MAYOR OR COUNTY MAYOR'S DESIGNEE TO EXECUTE SAME FOR AND ON BEHALF OF MIAMI-DADE COUNTY AND EXERCISE ALL PROVISIONS OF THE CONTRACT, INCLUDING ANY CANCELLATION, RENEWAL OR EXTENSIONS, PURSUANT TO SECTION 2-8.1 OF THE CODE OF MIAMI-DADE COUNTY AND IMPLEMENTING ORDER 3-38

WHEREAS, this Board desires to accomplish the purposes outlined in the accompanying memorandum, a copy of which is incorporated herein by reference,

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF MIAMI-DADE COUNTY, FLORIDA, that:

Section 1. This Board finds it is in the best interest of Miami-Dade County to award a bid waiver contract under *Contract No. BW-10523*, in substantially the form attached and made a part hereof, for the completion of the Advanced Traffic Management System (ATMS) project to Horsepower Electric, Inc. for the Department of Transportation and Public Works for a 10-year term in an amount not to exceed $199,919,376.66, pursuant to section 5.03(D) of the Home Rule Charter and section 2-8.1 of the Code of Miami-Dade County, by a two-thirds vote of the Board members present.

Section 2. This Board further authorizes the County Mayor or County Mayor's designee to execute the contract and to exercise all provisions of the contract, including any cancellation, renewal or extensions, pursuant to section 2-8.1 of the County Code and Implementing Order 3-38.

The foregoing resolution was offered by Commissioner , who moved its adoption. The motion was seconded by Commissioner and upon being put to a vote, the vote was as follows:

Oliver G. Gilbert, III, Chairman
Anthony Rodríguez, Vice Chairman

Marleine Bastien	Juan Carlos Bermudez
Kevin Marino Cabrera	Sen. René García
Roberto J. Gonzalez	Keon Hardemon
Danielle Cohen Higgins	Eileen Higgins
Kionne L. McGhee	Raquel A. Regalado
Micky Steinberg	

The Chairperson thereupon declared this resolution duly passed and adopted this 16th day of October, 2024. This resolution shall become effective upon the earlier of (1) 10 days after the date of its adoption unless vetoed by the County Mayor, and if vetoed, shall become effective only upon an override by this Board, or (2) approval by the County Mayor of this resolution and the filing of this approval with the Clerk of the Board.

MIAMI-DADE COUNTY, FLORIDA
BY ITS BOARD OF
COUNTY COMMISSIONERS

JUAN FERNANDEZ-BARQUIN, CLERK

By:_____
Deputy Clerk

Approved by County Attorney as
to form and legal sufficiency. D.P.C

Bruce Libhaber
Dale P. Clarke

ADVANCED TRAFFIC MANAGEMENT SYSTEM
CONTRACT NO. BW-10523

THIS AGREEMENT made and entered into as of this _____ day of _____, 2024 by and between Horsepower Electric Inc, a corporation organized and existing under the laws of the State of Florida, having its principal office at 8105 W. 20 Avenue, Hialeah, FL 33014 (hereinafter referred to as the "Contractor"), and Miami-Dade County, a political subdivision of the State of Florida, having its principal office at 111 N.W. 1st Street, Miami, Florida 33128 (hereinafter referred to as "the County"),

WITNESSETH:

WHEREAS, the Contractor has offered to upgrade the County's existing Advanced Traffic Management System (ATMS) and traffic signal controllers provide fully-actuate all signalized intersections, and provide Miscellaneous Engineering Implementation of traffic engineering solutions. The Contractor's work shall be performed on a non-exclusive basis and shall conform to; Appendix A (Scope of Work rev 1-29-20) and all attachments. Furthermore the Contractor shall comply with the requirements of this Agreement; and,

WHEREAS, the County desires to procure from the Contractor such ATMS services for the County, in accordance with the terms and conditions of this Agreement.

Contents

In consideration of the mutual covenants and agreements herein contained, the Parties hereto agree as follows:

ARTICLE 1 DEFINITIONS

The following words and expressions used in this Agreement shall be construed as follows, except when it is clear from the context that another meaning is intended:

1. The following words and expressions used in this Agreement shall be construed as follows, except when it is clear from the context that another meaning is intended:

2. The words "Contract" or "Agreement" to mean collectively these terms and conditions, the Scope of Work (Appendix A), all other appendices and attachments hereto, all amendments issued hereto, RFP No. 01058 and all associated addenda, and the Contractor's Proposal.

3. The words "Contract Date" to mean the date on which this Agreement is effective.

4. The words "Contract Manager" to mean Miami-Dade County's Director, Internal Services Department, or the duly authorized representative designated to manage the Contract.

5. The word "Contract Term" to mean the time between the Award Date and Final Completion.

6. The word "Contractor" to mean Horsepower Electric Inc,, its subcontractors/subconsultants, and its permitted successors.

7. The word "Days" or "days" to mean Calendar Days.

8. The word "Deliverables" to mean all documentation and any items of any nature submitted by the Contractor to the County's Project Manager for review and approval pursuant to the terms of this Agreement.

9. The word "DTPW" to mean Miami-Dade County Department of Transportation and Public Works.

10. The words "directed", "required", "permitted", "ordered", "designated", "selected", "prescribed" or words of like import to mean respectively, the direction, requirement, permission, order, designation, selection or prescription of the County's Project Manager; and similarly the words "approved", acceptable", "satisfactory", "equal", "necessary", or words of like import to mean respectively, approved by, or acceptable or satisfactory to, equal or necessary in the opinion of the County's Project Manager.

11. The words "Extra Work" or "Additional Work" to mean additions or deletions or modifications to the amount, type or value of the Work and Services as required in this Contract, as directed and/or approved by the County. "Extra Work" or "Additional Work" does not include any incidental or ancillary work necessary to complete tasks, work, services, or deliverables required by the Scope of Work.

12. The words "Project Manager" to mean the County Mayor, the County Project Manager, or the duly authorized representative(s) designated to manage the Project.

13. The words "Scope of Work", "Work", "Services", or "Program" to mean the document appended hereto as Appendix A, which details the work to be performed by the Contractor.

14. The word "subcontractor" or "subconsultant" to mean any person, entity, firm or corporation, other than the employees of the Contractor, who furnishes labor and/or materials, in connection with the Work, whether directly or indirectly, on behalf and/or under the direction of the Contractor and whether or not in privity of Contract with the Contractor.

ARTICLE 2 ORDER OF PRECEDENCE

The parts of the Contract Documents are complementary and are intended to include all items necessary for the Contractor's proper execution and completion of the Work; a requirement occurring in one is as binding as though occurring in all In cases of discrepancy, the governing order of the documents is as follows:

1. Change Orders to the Agreement

2. Notice to Proceed
3. Addenda
4. Form of Agreement
5. Scope of Work
6. Referenced Codes, Standards, and Specifications
7. Attachments and exhibits to the Request for Proposal
8. Request for Proposal
9. Other parts of the Contract Documents

ARTICLE 3 RULES OF INTERPRETATION

1. References to a specified Article, section or schedule shall be construed as reference to that specified Article, or section of, or schedule to this Agreement unless otherwise indicated.

2. Reference to any agreement or other instrument shall be deemed to include such agreement or other instrument as such agreement or other instrument may, from time to time, be modified, amended, supplemented, or restated in accordance with its terms.

3. The terms "hereof", "herein", "hereinafter", "hereby", "herewith", "hereto", and "hereunder" shall be deemed to refer to this Agreement.

4. The terms "directed", "required", "permitted", "ordered", "designated", "selected", "prescribed" or words of like import to mean respectively, the direction, requirement, permission, order, designation, selection or prescription of the Project Manager.

5. The terms "approved", acceptable", "satisfactory", "equal", "necessary", or words of like import to mean respectively, approved by, or acceptable or satisfactory to, equal or necessary in the opinion of the Project Manager.

6. The titles, headings, captions, and arrangements used in these Terms and Conditions are for convenience only and shall not be deemed to limit, amplify, or modify the terms of this Contract, nor affect the meaning thereof.

ARTICLE 4 NATURE OF THE AGREEMENT

A. This Agreement incorporates and includes all prior negotiations, correspondence, conversations, agreements, and understandings applicable to the matters contained in this Agreement. The Parties agree that there are no commitments, agreements, or understandings concerning the subject matter of this Agreement that are not contained in this Agreement, and that this Agreement contains the entire agreement between the Parties as to all matters contained herein. Accordingly, it is agreed that no deviation from the terms hereof shall be predicated upon any prior representations or agreements, whether oral or written. It is further agreed that any oral representations or modifications concerning this Agreement shall be of no force or effect, and that this Agreement may be modified, altered, or amended only by a written amendment duly executed by the Parties hereto or their authorized representatives.

B. The Contractor shall provide the services set forth in the Scope of Services and render full and prompt cooperation with the County in all aspects of the Work performed hereunder.

C. The Contractor acknowledges that this Agreement requires the performance of all things necessary for or incidental to the effective and complete performance of all Work under this Contract. All things not expressly mentioned in this Agreement but necessary to carrying out its intent are required by this Agreement, and the Contractor shall perform the same as though they were specifically mentioned, described, and delineated.

D. The Contractor shall furnish all labor, materials, tools, supplies, and other items required to perform the Work necessary for the completion of this Contract. All Work shall be accomplished at the direction of and to the satisfaction of the Project Manager.

E. The Contractor acknowledges that the County shall make all policy decisions regarding the Scope of Services. The Contractor agrees to provide input on policy issues in the form of recommendations. The Contractor shall implement all changes in providing services hereunder as a result of a policy change implemented by the County. The Contractor agrees to act in an expeditious and

fiscally sound manner in providing the County with input regarding the time and cost to implement said changes and in executing the activities required to implement said changes.

ARTICLE 5 CONTRACT TERM

The Contract shall become effective on the date identified on the first page of this Agreement and shall continue through the last day of the tenth (10th) year (3652 Days), thereafter. The County may extend this Contract for up to an additional three hundred sixty-five (365) calendar days beyond the current Contract period and will notify the Contractor in writing of the extension. This Contract may be extended beyond the initial one hundred-eighty (180) calendar day extension period by mutual agreement between the County and the Contractor, upon approval by the Board of County Commissioners (the "Board").

ARTICLE 6 NOTICE REQUIREMENTS

All notices required or permitted under this Agreement shall be in writing and shall be deemed sufficiently served if delivered by: (i) Registered or Certified Mail, with return receipt requested; (ii) personally by a by courier service; (iii) Federal Express Corporation or other nationally recognized carrier to be delivered overnight; or (iv) via facsimile or e-mail (if provided below) with delivery of hard copy pursuant to (i), (ii), or (iii) in this paragraph. The addresses for such notice are as follows:

(1) To the County

a) to the Project Manager:

Evelin Legcevic, P.E.
Traffic Engineering Manager, Traffic Signals and Signs Division
Miami-Dade County Public Works and Waste Management Department
7100 NW 36 Street
Miami, Florida 33166
E-mail: Evelin.Legcevic@miamidade.gov

and

b) to the Contract Manager:

Miami-Dade County
Strategic Procurement Department
Attention: Chief Procurement Officer
111 NW 1st Street, Suite 1300
Miami, FL 33128-1974
Phone: (305) 375-4900
Email: cpo@miamidade.gov

(2) To the Contractor

Horsepower Electric, Inc.
Attention: Michael Martinez
Address 8105 West 20 Ave Hialeah FL 33014
Phone: 305-819-4060
E-mail: mike@horsepowerelectric.com

Either party may at any time designate a different address and/or contact person by giving notice as provided above to the other party. Such notices shall be deemed given upon receipt by the addressee.

ARTICLE 7 PAYMENT FOR SERVICES/AMOUNT OBLIGATED

A. The Contractor warrants that it has reviewed the County's requirements, solely in its capacity as the Contractor, and has asked such questions and conducted such other inquiries as the Contractor deemed necessary in order to determine the price the Contractor will charge to provide the Work and Services to be performed under this Contract. The compensation for all Work and Services performed and completed under this Contract, including all costs associated with such Work and Services, shall be in the total amount of one hundred ninety-nine million nine hundred nineteen thousand three hundred seventy six dollars and sixty six cents ($199,919,376.66). The County shall have no obligation to pay the Contractor any additional sum in excess of this amount, except for a change and/or modification to the Contract, or an adjustment to quantities associated with unit prices, which is approved and executed in writing by the County and the Contractor.

B. All Work undertaken by the Contractor before County's approval of this Contract shall be at the Contractor's risk and expense.

C. With respect to travel costs and travel-related expenses, the Contractor agrees to adhere to Section 112.061 of the Florida Statutes as they pertain to out-of-pocket expenses, including employee lodging, transportation, per diem, and all miscellaneous cost and fees. The County shall not be liable for any such expenses that have not been approved in advance, in writing, by the County.

D. This firm fixed price contract will be established at amounts represented by Table 8.1 "Price Schedule".

ARTICLE 8 PRICING

A. Prices shall remain firm and fixed for the term of the Contract, including any extension periods; however, the Contractor may offer incentive discounts to the County at any time during the Contract term, including any renewal or extension thereof.

B. Unit Price Basis for Payment

The unit prices set forth by Table 8.1 Price Schedule shall be the basis for the contract price for all units, except for lump sum items. Payment of each unit price will be based on actual measured quantities of the Work, or planned quantities as stipulated in Appendix A (Scope of Work), except where the unit is a lump sum, in which case payment will be based upon the lump sum price as stated upon the completion of the associated work.

C. Progress Payment Basis for Payment

1. Item Numbers 1.1 and 1.2 of Table 8.1 Price Schedule, will be compensated by the County based on Monthly Progress Payments.

2. Prior to issuance of the NTP and as a condition thereof, Contractor shall submit to County Project Manager for review and approval, a preliminary Schedule of Values that:

   a. Logically subdivides the Work covered by the lump sum item into component parts with sufficient detail to serve as the basis for progress payments during performance of the Work and correlates to the Work Progress Schedule.
   b. Includes quantities and prices of items for all the Work which when added together equal the Contract Unit Price for the lump sum items.

3. The Schedule of Values will be acceptable to the County's Project Manager or Authorized Representative as to form and substance if it provides a reasonable allocation of the Lump Sum Item to component parts of the Work under said Item.

4. The Contractor will be required to submit at least ten (10) days prior to the next application for progress payment, a revised or updated Schedule of Values to address any changes in the Work.

D. Compensation for MOT – Traffic Control Officers

1. The County will reimburse Contractor for the services of uniformed law enforcement officers authorized to serve as Traffic Control Officers for the purpose of controlling or directing traffic in the work zone as part of the County approved Traffic Control Plan and Maintenance of Traffic (MOT) Plan provided by Contractor.

2. The amount to be paid will be the invoiced amount of the Contractor's Direct Out-of-Pocket expense attributed to the provision of a Traffic Control Officer certified to be on the project site, including any law enforcement vehicles and all other direct costs.

3. Payment will be made at invoice cost from the contract Allowance established by the County.

4. Payment will be made only for those Traffic Control Officers specified in the plans and authorized by the County Project Manager. The necessary invoices and documentation shall be submitted to the County Project Manager along with the payment request.

E. Payment for Nighttime Work

Both the County and the Contractor acknowledge that a significant portion of the Work for Task Group 1 will be performed during nighttime, which will incur an additional cost on the part of the Contractor for labor. The Contractor shall include and incorporate the costs for all nighttime work within their prices included in Table 8.1 "Price Schedule", of the Agreement (Item No. 4.2).

F. Unit Price Schedule

Table 8.1 Price Schedule

	Task Group 1: Traffic Signal Controller and Local Controller Software:				
Item No.	**Item Description**	**Unit**	**Estimated Quantity**	**Unit Price**	**Total**
1.1	System Delivery	LUMP SUM	1	$16,758,422.71	$16,758,422.71
1.2	Caltrans Model 2070LX Controller with Local Controller Software	EA	2999	$8,169.78	$24,501,155.23
1.3	Adjust/ Modify Existing Caltrans Model 2070LX Controller (1C Module w/ Local Controller Software)	EA	1	$4,796.60	$4,796.60
1.4	Controller Field Installation	EA	2999	$9,822.08	$29,456,429.54
1.5	Annual Local Controller Software Maintenance Support (After Year 5)	YEAR	5	$734,155.00	$3,670,775.00
1.6	Onsite Controller Expert Staff (2 person on-site) (First 5 Years)	YEAR	5	$1,165,650.00	$5,828,250.00
1.7	Annual Systems Training (After Year 5)	EA	5	$108,210.05	$541,050.25
				Total Task Group 1:	**$80,760,879.32**
	Optional Items				
1.8	Intersection Database Migration	EA	3000	$8,094.31	$24,282,943.50
1.9	Onsite Controller Expert Staff (2 person on-site) (After Year 5)	YEAR	5	$1,165,650.00	$5,828,250.00
1.10	Update the System Engineering Documents provided as Exhibit 11	LUMP SUM	1	$110,894.08	$110,894.08

1.11	ATMS Central Software (Including System Delivery)	LUMP SUM	1	$26,585,000.00	$26,585,000.00
1.12	Adjust/Modify Existing Caltrans Model 2070LX Update with 3rd Party Local Controller	EA	1	$3,230.08	$3,230.08

Task Group 2: Actuation of Signalized Intersections:

Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Total
2.1	Full Signalization Plans including Survey (TASK GROUP 2)	EA	600	$32,112.86	$19,267,715.97
2.2	Structural Analysis (TASK GROUP 2)	EA	60	$9,384.45	$563,067.23
2.3	Concrete Sidewalk and Driveways, 4" Thick	SY	456	$207.19	$94,478.26
2.4	Concrete Sidewalk and Driveways, 6" Thick	SY	4104	$221.89	$910,647.74
2.5	Detectable Warnings	SF	960	$31.92	$30,645.55
2.6	Conduit, F&I, Open Trench	LF	34800	$35.79	$1,245,405.00
2.7	Conduit, F&I, Directional Bore	LF	192000	$47.89	$9,195,628.80
2.8	Traffic Control Cable - (11-21 conductor) (Signal Cable - Repair/Replace/Other, F&I)	L.F.	1920	$27.19	$52,201.49
2.9	Traffic Control Cable - (4-7 conductor) (Signal Cable - Repair/Replace/Other, F&I)	L.F.	17280	$34.19	$590,844.67
2.10	Pull & Splice Box, F&I, 13" X 24" Cover Size	EA	3470	$2,607.38	$9,047,591.25
2.11	Pull & Splice Box, F&I, 24" X 36" Cover Size	EA	10	$6,031.23	$60,312.26
2.12	Electrical Power Service, F&I, Underground, Meter Furnished By Power Company	AS	120	$43,267.41	$5,192,089.76
2.13	Prestressed Concrete Pole, F&I, Type P-II Service (16 feet)	EA	120	$5,934.20	$712,104.17
2.14	Prestressed Concrete Pole, Complete Pole RemovalPedestal/Service Pole	EA	60	$2,449.12	$146,947.36
2.15	Aluminum Signal Pole, F&I, Pedestal	EA	440	$4,271.12	$1,879,290.79
2.16	Aluminum Signal Pole, F&I, Pedestrian Detector Post	EA	40	$3,169.75	$126,790.00
2.17	Removal of Existing Pedestrian Signal Pole	EA	40	$2,453.03	$98,121.15
2.18	Pedestrian Signal, F&I, LED-Count Down, 1 direction	EA	440	$1,533.75	$674,850.00
2.19	Pedestrian Signal, F&I, LED-Count Down, 2 direction	EA	40	$2,556.25	$102,250.00

2.20	Removal of Existing Pedestrian Signal, Pole/Pedestal to remain	EA	40	$76.75	$3,069.95
2.21	Inductive Loop Detector, F&I	EA	60	$383.24	$22,994.59
2.22	Loop Assembly, F&I, Type F	AS	110	$1,995.41	$219,494.96
2.23	Loop Assembly, F&I, Type F Modified (Bicycle)	AS	10	$1,995.41	$19,954.09
2.24	Vehicle Detection System- Microwave, F&I Cabinet Equipment	EA	120	$11,732.33	$1,407,879.43
2.25	Vehicle Detection System- Microwave, F&I Above Ground Equipment	EA	480	$16,054.33	$7,706,080.25
2.26	Vehicle Detection System- Video, F&I Cabinet Equipment	EA	480	$20,924.54	$10,043,780.28
2.27	Vehicle Detection System- Video, F&I Above Ground Equipment	EA	960	$9,713.75	$9,325,200.00
2.28	Multi-Sensor Vehicle Detection System, F&I Above Ground Equipment	EA	960	$13,394.75	$12,858,960.00
2.29	Pedestrian Detector, Standard	EA	480	$498.58	$239,318.99
2.30	Removal of Existing Pedestrian Detector, Pole/Pedestal to remain	EA	120	$92.71	$11,125.21
2.3	Vehicle Detection System- Video, Install Cabinet Equipment	EA	1	$12,917.24	$12,917.24
2.3	Vehicle Detection System- Video, Install Above Ground Equipment	EA	1	$7,732.15	$7,732.15
2.3	Multi-Sensor Vehicle Detection System, Install Above Ground Equipment	EA	1	$9,523.57	$9,523.57
				Total Task Group 2:	**$91,879,012.17**
	Optional Items				
2.3	Traffic Controller Assembly (Controller with cabinet) F&I	EA	1	$62,577.00	$62,577.00
2.4	Traffic Controller Assembly, Install (New Foundation)	AS	1	$29,243.50	$29,243.50
2.4	Traffic Controller Assembly, Install (Existing Foundation)	AS	1	$20,450.00	$20,450.00
2.4	Accessable (Audible/Tactile) Pedestrian System (Furnish and Install)	AS	1	$3,067.50	$3,067.50
				Total Task Group 2 Optional Items:	**$115,338.00**

Task Group 3: Miscellaneous Engineering Implementation - OPTIONAL

Item No.	Item Description : Engineering services and software development necessary for implementing features and functionality which are not specified in the work pertaining to TASK GROUP 1 and 2 may be requested by the Department. Engineering services and software development efforts will be measured per hour and paid for at the unit price upon validation and acceptance.	Unit	Estimated Quantity	Unit Price	Total
3.1	Update the System Engineering Documents provided as Exhibit 12	LUMP SUM	1	$67,505.45	$67,505.45
3.2	Review and Optimize existing traffic signal parameters and timing plans	INTERSECTION	1300	$4,499.00	$5,848,700.00
3.3	Design, configure and implement Advanced Engineering Solutions	INTERSECTION	600	$5,112.50	$3,067,500.00
3.4	Construction Project Manager	HOUR	1	$306.75	$306.75
3.5	Superintendent	HOUR	1	$230.06	$230.06
3.6	Traffic Signal Crew including Bucket truck and tooling	HOUR	1	$613.50	$613.50
3.7	Design Project Manager	HOUR	1	$432.01	$432.01
3.8	Discipline (Signal) Lead	HOUR	1	$352.25	$352.25
3.9	Senior Engineer	HOUR	1	$378.84	$378.84
3.10	Project Engineer	HOUR	1	$325.67	$325.67
3.1	Engineer	HOUR	1	$279.14	$279.14
3.1	Engineer Intern	HOUR	1	$199.39	$199.39
3.13	CADD Technician	HOUR	1	$199.39	$199.39
3.1	Clerical	HOUR	1	$139.57	$139.57
3.2	Designer	HOUR	1	$279.14	$279.14
3.16	Utility Coordinator	HOUR	1	$265.85	$265.85
3.2	Task Manager	HOUR	1	$476.80	$476.80
3.2	Principal Engineer	HOUR	1	$429.45	$429.45
3.19	Support Engineer	HOUR	1	$260.68	$260.68
3.20	Senior Software Developer	HOUR	1	$457.54	$457.54
3.2	Software Developer	HOUR	1	$326.90	$326.90
				Total Task Group 3:	**$8,989,658.38**

Item No.			
4.1	TO THE BASE PROPOSAL CONTRACT PRICE CALCULATED BASED ON THE ABOVE AMOUNTS, MIAMI-DADE COUNTY SHALL ADD MIAMI-DADE COUNTY'S DEPARTEMENT OF TRANSPORTATION AND PUBLIC WORKS' (DTPW) CONTINGENCY ALLOWANCE TO DETERMINE THE TOTAL CONTRACT AMOUNT. (10% OF ALL ITEMS ABOVE).	**Allowance:**	**$18,174,488.79**

TOTAL PROPOSAL PRICE (ALL ITEMS):	**$199,919,376.66**

G. Satisfactory Performance

The County's authorization of unit price payments is subject to the Contractor's satisfactory performance. The County may suspend or reduce the amount or quantity of units of work completed after finding the Contractor failed to comply with any material requirement of this contract.

H. Variable Quantities

The quantity of unit-priced items in this contract are estimated and may vary, as an increase or decrease to the number identified by Table 8.1 "Price Schedule", provided that County gives Contractor timely notice of such increase or decrease. For increases in the number of units, an impact to the Project Schedule shall be identified and substantiated by the Contractor and a reasonable extension shall be granted. With respect to any unit price item as to which an estimated quantity is set forth in payment provisions of the Contract, such unit price shall apply regardless of the actual quantity of such item ultimately utilized in, or required by, the Work; except that, if the actual quantity for a unit price item differs from the estimated quantity in the payment provisions by more than fifteen percent (15%), then upon request by the Contractor or determination by the County, the County shall review whether application of the Unit Price would cause a substantial inequity to either party, and, if so, the Unit Price for such item will be equitably adjusted, upward or downward, as substantiated and determined to be fair and reasonable between the Parties.

ARTICLE 9 METHOD AND TIMES OF PAYMENT

The Contractor may bill the County periodically, but not more than once per month, upon invoices certified by the Contractor pursuant to Appendix B. All invoices shall be taken from the books of account kept by the Contractor, shall be supported by copies of payroll distribution, receipt bills or other documents reasonably required by the County, shall show the County's contract number, and shall have a unique invoice number assigned by the Contractor. It is the policy of Miami-Dade County that payment for all purchases by County agencies and the Public Health Trust (the "Trust"), shall be made in a timely manner and that interest payments be made on late payments. All firms, including Small Business Enterprises, providing goods and services to the County, shall receive payment to maintain sufficient cash flow. In accordance with Section 218.74 of the Florida Statutes, and Section 2-8.1.4 of the Code of Miami-Dade County (the "Code"), the time at which payment shall be due from the County or Trust shall be forty-five (45) calendar days from receipt of a proper invoice. Billings from prime contractors under services and goods contracts with the County or Trust, that are Small Business Enterprise contract set-aside, bid preference or contain a subcontractor goal, shall be promptly reviewed and payment made by the County or Trust on those amounts not under dispute within fourteen (14) calendar days of receipt of such billing by the County or the Trust pursuant to Sections 2-8.1.1.1.1 and 2-8.1.1.1.2 of the Code. All payments due from the County or Trust, and not made within the time specified by this section shall bear interest from thirty (30) days after the due date at the rate of one percent (1%) per month on the unpaid balance. Further, proceedings to resolve disputes for payment of obligations shall be concluded by final written decision of the County Mayor, or his or her designee(s), not later than sixty (60) days after the date on which the proper invoice was received by the County or Trust.

In accordance with Miami-Dade County Implementing Order No. 3-9, Accounts Receivable Adjustments, if money is owed by the Contractor to the County, whether under this Contract or for any other purpose, the County reserves the right to retain such amount from payment due by County to the Contractor under this Contract. Such retained amount shall be applied to the amount owed by the Contractor to the County. The Contractor shall have no further claim to such retained amounts which shall be deemed full accord and satisfaction of the amount due by the County to the Contractor for the applicable payment due herein.

Invoices and associated back-up documentation shall be submitted electronically or in hard copy format by the Contractor to the County as follows:

- Electronic submission (preferred) to invsubp@miamidade.gov; or

- Hard copy format mailed to:
  Miami-Dade County, Finance Shared Services
  111 NW 1st Street, 26 Floor
  Miami, Florida 33128

Invoice shall include a Bill to Address, which is the County department being invoiced for the services.

Bill to: Department of Transportation and Public Works
Traffic Signals and Signs Division
7100 NW 26 Street
Miami, Florida 33166
Attention: ATMS Project Manager

The County may at any time designate a different address and/or contact person by giving written notice to the other party.

ARTICLE 10 INDEMNIFICATION AND INSURANCE

Contractor shall indemnify and hold harmless the County and its officers, employees, agents and instrumentalities from any and all liability, losses or damages, including reasonable attorneys' fees and costs of defense, which the County or its officers, employees, agents or instrumentalities may incur as a result of claims, demands, suits, causes of actions or proceedings of any kind or nature to the extent arising out of, relating to or resulting from the Contractor's negligent acts, omissions, or willful misconduct in the performance of this Agreement by the Contractor or its employees, agents, servants, partners principals or subcontractors, except to the extent such actions, claims, damages to persons or property, penalties, obligations, or liabilities arise from the negligent acts, omissions, or willful misconduct of the County, its officers, employees and agents. The Contractor shall pay all claims and losses in connection therewith and shall investigate and defend all claims, suits or actions of any kind or nature in the name of the County, where applicable, including appellate proceedings, and shall pay all costs, judgments, and attorney's fees which may issue thereon. Contractor expressly understands and agrees that any insurance protection required by this Agreement or otherwise provided by Contractor shall in no way limit the responsibility to indemnify, keep and save harmless and defend the County or its officers, employees, agents and instrumentalities as herein provided.

The Contractor shall furnish to Internal Services Department, Procurement Management Division, 111 NW 1st Street, Miami, FL 33128, Certificate(s) of Insurance which indicate that insurance coverage has been obtained which meets the requirements as outlined below:

A. Worker's Compensation Insurance for all employees of the Contractor as required by Florida Statute 440, including Employers Liability in an amount not less than $1,000,000.

B. Commercial General Liability Insurance on a comprehensive basis in an amount not less than $5,000,000 per occurrence. **Miami-Dade County must be shown as an additional insured with respect to this coverage.**

C. Automobile Liability Insurance covering all owned, non-owned and hired vehicles used in connection with the work, in an amount not less than $1,000,000 combined single limit per occurrence for bodily injury and property damage.

D. Professional Liability Insurance in an amount not less than $1,000,000 per claim.

All insurance policies required above shall be issued by companies authorized to do business under the laws of the State of Florida, with the following qualifications:

The company must be rated no less than "A-" as to management, and no less than "Class VII" as to financial strength by Best's Insurance Guide, published by A.M. Best Company, Oldwick, New Jersey, or its equivalent, subject to the approval of the County Risk Management Division.

or

The company must hold a valid Florida Certificate of Authority as shown in the latest "List of All Insurance Companies Authorized or Approved to Do Business in Florida" issued by the State of Florida Department of Financial Services.

CERTIFICATE HOLDER MUST READ: **MIAMI-DADE COUNTY**
111 NW 1st STREET
SUITE 2340
MIAMI, FL 33128

Compliance with the foregoing requirements shall not relieve the Contractor of this liability and obligation under this section or under any other section in this Agreement.

Award of this Contract is contingent upon the receipt of the insurance documents, as required, within ten (10) business days. If the insurance certificate is received within the specified timeframe but not in the manner prescribed in this Agreement, the Contractor shall have an additional five (5) business days to submit a corrected certificate to the County. If the Contractor fails to submit the required insurance documents in the manner prescribed in this Agreement within fifteen (15) business days, the Contractor shall be in default of the contractual terms and conditions and award of the Contract may be rescinded, unless such timeframe for submission has been extended by the County.

If the Certificate(s) of Insurance is scheduled to expire during the term of the Contract, the Contractor shall submit new or renewed Certificate(s) of Insurance to the County a minimum of ten (10) calendar days before such expiration. In the event that expired Certificates of Insurance are not replaced or renewed to cover the Contract period, the County may suspend the Contract until the new or renewed certificates are received by the County in the manner prescribed herein. If such suspension exceeds thirty (30) calendar days, the County may, at its sole discretion, terminate the Contract for cause and the Contractor shall be responsible for all direct and indirect costs associated with such termination.

ARTICLE 11 PERFORMANCE AND PAYMENT BOND

A. Prior to commencing construction, Contractor shall obtain and deliver to the County, at its sole cost and expense, both a payment bond and performance bond, or such other alternate form of security, any or all of which meets the requirements of Section 255.05, Florida Statutes, as set forth below, not less than ten (10) business days prior to the anticipated commencement date of the construction. Said payment and performance bonds shall be in favor of the County, the form of such bonds shall be as provided by Section 255.05, Florida Statutes, and each shall be in the amount of the entire cost of the construction of the Project, or any addition thereto, or in instances of repair, the total cost associated with the repair project regardless of the source of funding. The cost of Construction is equal to the cumulative amounts of Item Nos. 1.4, and 2.2 through 2.37 of Table 8.1 Price Schedule, see Article 8. The Payment and Performance Bonds shall name the County as an obligee on the multiple obligee rider attached to the Payment and Performance Bonds and shall be issued by a surety insurer authorized to do business in the State of Florida. The bonds shall be subject to review and approval by Miami-Dade County, Internal Services Department, Risk Management Division, as well as the Miami-Dade Department of Transportation and Public Works. The Contractor shall be responsible for recording the bonds in the public records of Miami-Dade County and providing notice to subcontractors and suppliers, as required by Section 255.05 of the Florida Statutes. Said Payment and Performance Bonds shall be maintained in full force and effect for the contract term.
b)

B. No later than sixty (60) day prior to the expiration of the contract term, Contractor shall present to the County, at the exclusive expense of Contractor, a Warranty Bond for an amount equivalent to 5% of the Contract Price. The Warranty Bond shall be issued by a bond institution, compliant with the requirements of this Article. The Warranty Bond presented by Contractor pursuant to this Article shall be enforceable and remain in effect until the end of the Warranty Period or Extended Warranty Period, if applicable, event in which the County shall notify the bonding institution .

C. Bonds must be obtained from guarantee or surety companies acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. U.S. Treasury Circular Number 570, published annually in the Federal Register, lists companies approved to act as sureties on bonds securing Government contracts, the maximum underwriting limits on each

contract bonded, and the States in which the company is licensed to do business. Use of a company listed in this circular is mandatory. Free copies of the circular may be obtained by writing directly to: U.S. Department of Treasury, Financial Management Service, Surety Bond Branch, 401 14th Street, SW, 2nd Floor, West Wing, Washington, D.C. 20226.

D. The current power of attorney for the person who signs for the surety company must be attached to the bond. The effective date of the power of attorney shall not precede the date of the bond. The effective date of the bond(s) shall be prior to the issuance of the Notice to Proceed. The County may negotiate the amount of the bond(s) depending on the stage of the Project.

E. Failure by the Contractor and its subcontractors to obtain the required Performance and Payment bonds within the time specified, or within such extended period as the County may grant based upon reasons determined adequate by the County, shall be deemed an event of default, and the contract, and any other ancillary agreement and/or documentation related to the contract shall be subject to termination at the sole discretion of the County.

ARTICLE 12 MANNER OF PERFORMANCE

a) The Contractor shall perform the Work described herein in a competent and professional manner satisfactory to the County in accordance with the terms and conditions of this Agreement and the requirements of Article 1.06 (Prosecution and Progress) of DTPW Division 01 Construction Specifications (Exhibit 1 to Appendix A). The County shall be entitled to a satisfactory performance of all Work described herein and to full and prompt cooperation by the Contractor in all aspects of the Work. At the request of the County, the Contractor shall promptly remove from the Project any Contractor's employee, Subcontractor, or any other person performing Work hereunder. The Contractor agrees that such removal of any of its employees does not require the termination or demotion of any employee by the Contractor.

b) The Contractor agrees to defend, hold harmless and indemnify the County and shall be liable and responsible for all claims, suits, actions, damages, and costs (including attorneys' fees and court costs) made against the County, occurring on account of, arising from or in connection with the removal and replacement of any Contractor's personnel performing Services hereunder at the behest of the County. Removal and replacement of any Contractor's personnel as used in this Article shall not require the termination and/or demotion of such Contractor's personnel.

c) The Contractor always agrees that it will employ, maintain, and assign to the performance of the Work a sufficient number of competent and qualified professionals and other personnel to meet the requirements to which reference is hereinafter made. The Contractor agrees to adjust its personnel staffing levels or to replace any its personnel if so, directed upon reasonable request from the County, should the County make a determination, in its sole discretion, that said personnel staffing is inappropriate or that any individual is not performing in a manner consistent with the requirements for such a position.

d) The Contractor warrants and represents that its personnel have the proper skill, training, background, knowledge, experience, rights, authorizations, integrity, character, and licenses as necessary to perform the Work described herein, in a competent and professional manner.

e) The Contractor shall always cooperate with the County and coordinate its respective work efforts to maintain the progress most effectively and efficiently in performing the Work.

f) The Contractor shall comply with all provisions of all federal, state, and local laws, statutes, ordinances, and regulations that are applicable to the performance of this Agreement.

ARTICLE 13 CONSENT OF THE COUNTY REQURIED FOR ASSIGNMENT

The Contractor shall not assign, transfer, convey or otherwise dispose of this Agreement, including its rights, title, or interest in or to the same or any part thereof without the prior written consent of the County.

ARTICLE 14 EMPLOYEES OF THE CONTRACTOR

All employees of the Contractor shall be, at all times, employees of the Contractor under its sole direction and not employees or agents of the County. The Contractor shall supply competent employees. Miami-Dade County may require the Contractor to remove an employee it deems careless, incompetent, insubordinate or otherwise objectionable and whose continued employment on County

property is not in the best interest of the County. Each employee shall have and wear proper identification.

ARTICLE 15 WORK DAY

A. Unless explicitly specified otherwise herein, a **Standard Workday is defined as Monday through Friday,** 7:00 AM to 5:00 PM, excluding holidays.

B. Any provisions applicable to a **Standard Workday,** set forth in the Contract Documents, will apply to this paragraph and is hereby incorporated by reference.

County Holidays are:
New Year's Day
Martin Luther King, Jr. Day
President's Day
Law Enforcement Appreciation Day
Memorial Day
Juneteenth Day
Independence Day
Labor Day
Columbus Day
Veterans' Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

ARTICLE 16 SUBSTITUTION OF PERSONNEL

In the event the Contractor needs to substitute personnel for the key personnel identified by the Contractor's Proposal, the Contractor must notify the County in writing and request written approval for the substitution at least ten (10) business days prior to effecting such substitution. However, such substitution shall not become effective until the County has approved said substitution.

ARTICLE 17 INDEPENDENT CONTRACTOR RELATIONSHIP

The Contractor is, and shall be, in the performance of all Work and activities under this Agreement, an independent contractor, and not an employee, agent or servant of the County. All persons engaged in any of the Work performed or Services provided pursuant to this Agreement shall always, and in all places, be subject to the Contractor's sole direction, supervision, and control. The Contractor shall exercise control over the means and manner in which it and its employees perform the Work, and in all respects the Contractor's relationship and the relationship of its employees to the County shall be that of an independent contractor and not as employees and agents of the County.

The Contractor does not have the power or authority to bind the County in any promise, agreement, or representation other than specifically provided for in this Agreement.

ARTICLE 18 AUTHORITY OF THE COUNTY PROJECT MANAGER

A. The Contractor shall be bound by all orders of the Project Manager to perform the Work, including the withdrawal or modification of any previous order and regardless of whether the Contractor agrees with the Project Manager's order.

B. Where orders are given orally, they will be issued in writing by the Project Manager as soon thereafter as is practicable. If the Contractor determines the order of the Project Manager results in a change to the Contractor's costs or an adverse impact to the project schedule, the Contractor shall have the right to claim the change(s) as Extra Work, in accordance with the provisions of Article 40, *Extra Work*.

The authority of the Project Manager to issue oral directions are limited to the following conditions:

- Safety
- Emergencies, i.e. damages to property, error and omissions impacting the Work
- Code and legislative changes
- Differing site conditions

C. The Contractor must seek to resolve every difference concerning the Agreement with the Project Manager. In the event that the Contractor and the Project Manager are unable to resolve their difference, the Contractor may initiate a dispute in accordance with the provisions of Article 47, *Dispute Resolution Procedure*.

ARTICLE 19 CONTRACTOR'S REPRESENTATIVE

A. Contractor shall have a Representative (or Project Manager) with full authority to represent and act for the Contractor. Prior to the County's issuance of a Notice to Proceed (NTP), Contractor shall submit (for the County's review and acceptance) the name, qualifications and experience of its proposed Contractor's Representative.

B. Contractor's Representative shall act for the Contractor in all matters concerning the Work, and, subject to all requirements of this Contract, shall have the following authority and obligations:

1. Ability to so organize the Work, and the Work of its Subcontractors, to complete the Work in accordance with the Contract and the Contractor's bar chart, as accepted by the County Project Manager.

2. Ability to delegate defined authority to other Contractor personnel (who thus also become Contractor's Representatives, as provided in this Contract, to the extent specified), subject to written notice to, and approval by, the Project Manager.

3. During performance of the Work, Contractor's Representative shall be present at the Worksite(s) or have its fully empowered delegate present at the Worksite, at all times that any Work is in progress or at any time any employee or Subcontractor of the Contractor is present at the Worksite.

ARTICLE 20 ACCESS TO THE WORKSITE(S)

A. The County will, at all times during the term of the contract, have access to the Work at the Worksite(s), and all documents on which the Work is based.

B. At any time during the term of the contract, upon reasonable notice, the County may review the documents on which the Work is based, inspect the Worksite(s), and review, inspect and test all Work, equipment, software, and all other materials wherever located (collectively "Inspect" or "Inspection").

ARTICLE 21 CONTRACTOR NOTICES TO THE COUNTY

All Notices to the County under this Contract shall be in writing to the County Project Manager for the subject matter of the Notice, with a copy to the Contracting Officer. No notice shall be effective unless it was delivered to the Project Manager and to the Contracting Officer as provided in this Contract.

ARTICLE 22 CONTRACTOR'S REPRESENTATIONS, WARRANTIES AND COVENANTS

Contractor represents, warrants and covenants for the benefit of the County that:

A. Status – If it is a corporation, limited partnership, general partnership, and/or joint venture, it is duly organized, validly existing and in good standing under the Laws of its jurisdiction of formation and has full power and authority to own and operate its business and properties and perform the Work within the State of Florida.

B. Review of Information and Inspection of the Worksite(s) – It has, in accordance with prudent and generally accepted engineering and industry practices:

1. Reviewed all of the information provided in the Contract (including reports provided by the County);

2. Inspected and evaluated the Worksite(s) and surrounding locations to the extent reasonably observable by the Contractor as well as to the extent the Contractor deems necessary or advisable for performing all portions/phases of the Work under the Contract. These inspections and evaluations include without limitation:

   a. The character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the Worksite(s), including review of the Contract Documents provided by the County.
   b. Conditions bearing upon transportation, disposal, handling, and storage of materials, goods, and equipment.
   c. The availability of labor, water, electric power, and roads.
   d. Uncertainties of weather, or physical conditions at the site.
   e. The conformation and conditions of the ground.
   f. The character of equipment and facilities needed preliminary to and during Work performance; and
   g. Conditions bearing upon security and protection of material, Goods, Equipment, and Work in progress.

C. Physical Requirements – As a result of its inspection and examination of the Worksite(s), and other related and surrounding sites and conditions, it is familiar with and accepts the physical requirements of the Work.

D. Feasibility – As a result of its review of all the information and its inspection and examination of the Worksite(s), it has evaluated the feasibility of performing the Contract within the Contract Time and for the Total Contract Price and has reasonable grounds for believing and does believe that such performance, including achievement of Substantial Completion or Final Acceptance of the Project within the Contract Time, for the Total Contract Price is feasible and practicable.

E. Permits and Governmental Approvals – Based upon its review of the Contract Documents, it shall be able to obtain and keep in effect throughout the Contract Time all permits and other Governmental Approvals the Contractor is obligated to obtain in accordance with the Contract.

F. Difficulty and Cost of Work – It has estimated the difficulty and cost of successfully performing the Work, and based upon that estimate has concluded that it can successfully perform the Work at the Total Contract Price.

ARTICLE 23 STORM OR DISASTER SERVICES

A. Contractor, by accepting the award of this Contract, recognizes and agrees that should a storm or other severe and catastrophic natural disaster affect the Miami-Dade-County area during the performance of the Work, Contractor shall make every reasonable effort to provide services contracted for during the contract period, subject to the provisions of Article 39, *Force Majeure*. Work performed shall equal to the Contract prices and at the same or different locations from those covered by this Contract.

B. For emergency services and conditions not addressed by this Contract, Contractor and County agrees to negotiate reasonable prices and terms with the County for any disaster-relief work required by the County. In all instances, Contractor agrees to negotiate reasonable time extensions for performance of disaster-relief work and Work impacted by storms or other severe and catastrophic natural disasters, and Force Majeure Events.

ARTICLE 24 EMERGENCIES

In case of an Emergency or hazard to health or safety caused by Contractor or its Subcontractors requiring immediate curative action, the County will notify Contractor, and Contractor shall immediately take such action(s) as it deems necessary, notifying the Project Manager of the action(s) taken as soon as possible but no later than one (1) business day thereafter. If Contractor does not undertake immediate curative action, the County may without prior notice undertake such action as is necessary to correct the hazard or deal with the Emergency, and the reasonable excess cost thereof shall be borne by the Contractor.

ARTICLE 25 COOPERATION AND COORDINATION WITH OTHER CONCTRACTORS AND/OR COUNTY OPERATIONS

A. The County reserves the right and may undertake or award other contracts for additional Work on or near the Worksite(s). Contractor warrants that it has carefully reviewed the Contract Documents and all other pertinent information made available by the County that relate to the nature and scheduling of other contracts that may be awarded, and to constraints related to the County operations, and in submitting its proposed/proposal and executing this Contract, has taken into account the need to coordinate its Work with that of other Contractors and/or the County Operations. It is the express obligation and duty of the Contractor under the Contract to coordinate its Work with the work of others.

B. The following shall apply:

1. Contractor shall not have exclusive access to or use of Work areas or the Worksite(s). The County may require that Contractor use certain facilities and areas concurrently with others.

2. The County will endeavor to advise the Contractor of the other known parties, including the County Operations.

3. Contractor shall cooperate and communicate with any other Contractor performing Work that may connect, complement, and/or interfere with the Contractor's Work, and resolve any disputes or coordination problems with such Contractor.

ARTICLE 26 CLEAN UP

A. Throughout all phases of contracted work, and until Final Completion of the Work, Contractor shall keep the Worksite, including storage and public areas used by Contractor, clean and free from rubbish and debris.

B. Before completing the Work, Contractor shall remove from the Worksite any rubbish, tools, and equipment that are not the property of the County.

ARTICLE 27 DISPOSAL OF WASTE

A. Unless otherwise specified in the Contract, Contractor shall make its own arrangements for disposing of waste and excess substances generated from Contractor's performance of the Work at a legal disposal site outside the Worksite(s) and shall pay all associated costs and obtain necessary permits, if any.

B. Contractor agrees to indemnify and hold harmless the County from any dumping duty, loss or expense, including, but not limited to, reasonable attorney fees which the County may incur arising from any claim or demand alleging that the sale of the equipment covered by this contract at the price therefor stated herein violates the U.S. Antidumping Act, Title 19 U.S. Code Annotated, Section 160 et. seq.

ARTICLE 28 LAWS AND PERMITS

A. The Contractor shall comply with all provisions of federal, state, and local laws, ordinances, rules, regulations and orders which would affect the Work as if it were being performed for a private corporation, except where different requirements are specifically set forth in the Contract.

B. If the Work requires the Contractor to open, alter, remove, damage or otherwise affect property owned by a federal, state, or local government, the Contractor shall obtain in its own name any permit or license required to allow such property to be so affected. However, the Contractor shall not apply for any permit or license in the name of, or on behalf of, the County or take any other actions which would subject the County to any laws, ordinances, rules, regulations and orders from which it is exempt.

ARTICLE 29 PROJECT SCHEDULE

A. Contractor shall submit for review and acceptance a Work Progress Schedule meeting the requirements of DTPW Division 01 Construction Specifications (Exhibit 1 to Appendix A) within 21 days after Contract award or at the Preconstruction Conference, whichever is earlier. Additional information and detail may be requested by the County, and it shall be added to the Work Progress Schedule in order to properly measure and determine the progression of work. The Work Progress Schedule must be updated monthly after issuance of the NTP and be submitted along with the Monthly Progress Report (Article 31) and meet all additional updating requirements stipulated in DTPW Division 01 Construction Specifications (Exhibit 1 to Appendix A).

ARTICLE 30 SEQUENCE OF OPERATIONS

The Contractor must propose a sequence of operations as required by DTPW Division 01 Construction Specifications (Exhibit 1 to Appendix A).

ARTICLE 31 PROJECT PROGRESS MEETINGS

A. Regular progress meetings will be held by the Contractor pursuant to the requirements stipulated in DTPW Division 01 Construction Specifications (Exhibit 1 to Appendix A). The County has sole discretion in adjust the frequency of such meetings. The Contractor's Project Manager and other appropriate personnel shall attend these, and all meetings called by the County to discuss Work under this Contract. The Contractor will be advised of times, dates and place of other Contract meetings.

B. At these meetings, the Contractor shall provide the following:

1. A list of major subcontractors, sequence of critical Work, and the preliminary progress schedule for construction.
2. Requirements for office, storage areas, construction areas, and temporary easements.
3. Discussions of safety, first aid, emergency actions, and security.
4. Housekeeping procedures.
5. Implementation methods, quality control, and inspection and coordination of Work.
6. The implementation sequencing of the Work
7. Plans for coordination and notification for utility Work.
8. Plans for coordination with the Work of other contractors and procedures for sharing access to the Work Site.
9. Schedules of deliveries of major equipment.

C. Any field explanations or interpretations provided by the County at this or other meetings will not amend, supersede or alter the terms or meaning of any Contract Document, and the Contractor shall not claim reliance on such explanation as a defense to any breach or failure by the Contractor to perform as specified in the Contract.

ARTICLE 32 MONTHLY PROGRESS REPORT

A. Every month the Contractor shall submit to the County a monthly progress report one copy in electronic format, this report shall contain the following sections and meet the requirements of DTPW Division 01 Construction Specifications (Exhibit 1 to Appendix A):

1. Executive summary.
2. A Schedule Status Report, including a Work Schedule showing scheduled and actual progress to date for each Work element, derived from the Network Analysis, and containing a textual description of the progress of the Work. The report shall discuss the major steps of the Work, along with the planned and actual dates of progress and completion forecasts. The report shall focus on any out-of-schedule and/or problem items and shall present the Contractor's plan for correcting the deviations.
3. Status of payments, retention and withholding.
4. A forecast of the amounts of future Applications for Payment over the next six months.
5. An updated Network Analysis, with all changes highlighted.
6. An updated Work Schedule, with all revisions highlighted.
7. An updated Submittal Schedule, with all revisions highlighted.
8. An updated Schedule of Values, with all revisions highlighted.

9. Status of action items resulting from meetings.
10. Task activities planned for next month.
11. Identification of any quality assurance problems.
12. Solution Implementation critical issues.
13. Copies of logs for incoming and outgoing correspondence and documents for the report period.
14. Release of Liens from subcontractors, and suppliers.

B. The exact format and detail level required for the Monthly Progress Report shall be established jointly by the County and the Contractor as part of Conceptual Design Review on a proposed format prepared by the Contractor and accepted by the County.

ARTICLE 33 NOTICE OF DISCOVERY OF DIFFERING SITE CONDITIONS

Contractor shall, before any of the existing conditions are disturbed, provide immediate oral and/or electronic mail notice of the discovery of such conditions to the County's Authorized Representative, followed by written notice to the County Project Manager of the discovery within forty-eight (48) hours thereafter, of any of the following subsurface conditions:

1. Type 1 Condition: Subsurface or latent physical conditions at the Worksite differing materially from those indicated in the Contract;

2. Type 2 Condition: Unknown physical conditions at the Worksite of any unusual nature that differ materially from those ordinarily encountered in and generally recognized as inherent in Work of the character provided for in the Contract.

3. Type 3 Condition: Substances that Contractor believes may be Hazardous Substances that are required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of Law.

If Contractor encounters substances or conditions during performance of the Work that it reasonably believes to be a Type 1 Condition or Type 2 Condition, Contractor shall not disturb the condition or interfere with the County's right or ability to investigate but may continue Work in the area. The Contractor shall document and submit such conditions in a written field report (including photographs) within five (5) Days of the initial notice to the County and include a recommendation how to safely proceed with Work at the area.

If Contractor encounters substances during performance of the Work that it reasonably believes to be a Hazardous Substance, a Type 3 Condition, Contractor shall not disturb the condition and shall suspend Work in the immediate area of the suspected Hazardous Substances until the County authorizes it to resume. The Contractor shall document and submit such conditions in a written field report (including photographs) within five (5) Days of the initial notice to the County and include a recommendation how to safely proceed Work at the area.

The County will promptly investigate the conditions, and if it finds the conditions do materially differ, or do involve previously unknown Hazardous Substances. The County may make an adjustment in Contract Time and/or Total Contract Price as agreed upon.

ARTICLE 34 ALTERNATIVE CODES AND STANDARDS

Codes and Standards not in accordance with those contained in the Contract shall not be used unless accepted by the County Project Manager in writing. If the Contractor wishes to utilize codes or standards not specified in the Contract, Contractor shall submit for acceptance, sufficient information for the County Project Manager to determine Equivalency. Information shall include, but not be limited to, detailed comparison of the substitute standard/code, the rationale for Substitution, and whether it meets or exceeds the existing standard/code specified in the Contract.

ARTICLE 35 CLAIMS REGARDING DIFFERING SITE CONDITIONS

Contractor shall not be entitled to any remedy for an asserted Differing Site Condition if it does not give the County both:

1. Timely notice of the asserted Differing Site Condition, as required in accordance with Article 34 above; and

2. Submit a written field report (including photographs) within five (5) Days of the initial notice to the County as required in Article 32, *Notice of Discovery of Differing Site Conditions*, of this document; and

3. An opportunity to investigate prior to the asserted Differing Site Condition being disturbed.

ARTICLE 36 PROCEED WITH WORK

If a Dispute arises related to a claim of a Differing Site Condition, Contractor shall proceed with all Work to be performed under the Contract that is not affected by the Differing Site Condition and shall not be excused from any provision of the Contract with regard to that Work, including without limitation, the Scheduled Completion Date.

ARTICLE 37 DAMAGES FOR DELAY

A. The Work Progress Schedule, submitted pursuant to the requirements of DTPW Division 01 Construction Specifications (Exhibit 1 to Appendix A) and arranged by Task Group, identifies the various milestones, deliverables, activities of work, dates, and details to demonstrate a reasonable and workable plan to initiate, construct, and complete all requirements of the Contract Documents. Required Work is separated into three distinct but interrelated Task Groups that are described within Scope of Work (Attachment B) and specified in the Contract Documents.

B. Liquidated Damages Pertaining to Completion of Task Group Work.

1. Contractor, or in case of his default the surety, shall pay to the County, not as a penalty but as liquidated damages, the amount stipulated below should Contractor or, in the case of his default the surety, fail to complete all required Task Group work (including completion of all punch list items and the delivery of warranties and required documents) within the times stipulated for completion for each Task Group, including extra time granted in writing by the County.
2. Applicable liquidated damages for each day after the scheduled substantial completion date for each Task Group is the amounts established in Table 37 below.
3. Contractor shall pay to the County as liquidated damages, the daily amount stipulated below in Table 37 "Schedule of Damages" should Contractor fail to;

    a. Substantially complete all work specified within each Task Group within the time(s) stipulated for Substantial Completion of the Task Group, including extra time granted in writing by the County, and
    b. Complete all Task Group Work (including completion of all punch list items, delivery of warranties, and required documents) stipulated in the Contract sixty (60) days after the scheduled Task Group substantial completion date(s).
    c. Liquidated damages for failing to timely attain Task Group substantial completion and its corresponding Task Group final completion are not additive and will not be imposed concurrently:

Table 37 – Schedule of Damages

Total Contract Amount for Task Group	Daily Charge Per Calendar Day
$50,000 and under	$956
Over $50,000 but less than $250,000	$964
$250,000 but less than $500,000	$1,241
$500,000 but less than $2,500,000	$1,665
$2,500,000 but less than $5,000,000	$2,712
$5,000,000 but less than $10,000,000	$3,447
$10,000,000 but less than $15,000,000	$4,866
$15,000,000 but less than $20,000,000	$5,818

$20,000,000 and over	$9,198 plus 0.00005 of any amount over $20 million (Round to nearest whole dollar)

4. Upon Substantial Completion of the Task Group Work as determined by the Engineer, the Contractor shall be issued a Certificate of Substantial Completion and Liquidated Damages shall cease to accrue.
5. Upon Final Completion of all Task Group Work as determined by the Engineer, the Contractor shall be issued a Certificate of Substantial Completion and Liquidated Damages shall cease to accrue.

C. Milestones and Deliverables: In addition to the Liquidated damage amounts described above, Contractor, or in case of his default the surety, shall pay to the County, not as a penalty but as liquidated damages, the daily amount stipulated below in Table 38 should Contractor fail to meet/deliver the listed milestone(s) or deliverable(s). The amounts listed in Table 38 are in addition to the amounts defined in the preceding paragraphs.

Table 38 – Schedule of Damages (Milestones and Deliverables)

ID No.#	Deliverable/Milestone Description	Due Date	Daily Charge Per Calendar Day
LD#1	Completion of Traffic Controller Functions Testing	Six (6) Months from date of NTP	$100
LD#2	Traffic Signal Controller Final Acceptance per Asset	One hundred eighty (180) days from date of Asset Release to Construction /Installation	$50
LD#3	Minimum of Five Hundred (500) 2070LX Traffic Controllers along with the local controller software deployed, integrated, tested and provided final acceptance by TSS Division.	Three-hundred and sixty-five (365) days from approval of Completion of the Function Testing, and every three-hundred and sixty-five (365) days thereafter.	$1000
LD#4	TG2 Final Acceptance per Asset (Complete the Deployment and Final Acceptance by TSS)	Ninety (90) days after Traffic Signal Permit Final inspection and/or expiration, whichever is earliest	$500

D. The County shall have the right to deduct such Liquidated Damages from any monies due or which may thereafter become due to the Contractor under this Contract. If the amount which may become due hereunder shall be less than the amount of Liquidated Damages due to the County, the Contractor may be obligated to pay the difference immediately upon demand by the County.

E. County does not waive its right to liquidated damages due under the Contract by allowing Contractor to continue and to finish the work, or any part of it, after the expiration of the Contract/Task Order Time including granted time extensions.

F. County hereby waives its right to claim or assert any consequential damages sustained as a result of Contractor's failure to meet the Substantial Completion date. County's sole remedy of any delay in obtaining Substantial Completion shall be the ability to claim Liquidated Damages. Notwithstanding the foregoing, Contractor's liability to County for liquidated damages shall be limited to fifteen percent (15%) of the total Contract Value paid to Contractor to date.

ARTICLE 38 ERRORS, OMISSIONS, INTERPRETATIONS

Contractor shall carefully and continuously study and compare all Contract Documents; and verify all stated requirements in the Contract Documents before commencing Work.

Request for Information, Notification, and Contractor Performance:

A. Should it appear that the Work to be done, or any of the matters relative thereto, is not sufficiently detailed or explained in any the County-furnished Contract Documents, Contractor shall submit a Request for Information (RFI), in writing to the County's Project Manager, asking for such further written explanations as may be necessary. Contractor shall conform to the explanation provided.

B. Contractor shall promptly notify the County of all deficiencies (including inaccuracies and inconsistencies) it may discover in the County-furnished Contract Documents and obtain specific instructions in writing regarding any such Deficiency, before proceeding with the Work affected thereby.

C. Omission of any technical provisions in the Contract Documents, or the misdescription of details of Work which are necessary to carry out the intent of the County-furnished Contract Documents, or which are customarily performed, shall not relieve Contractor from performing such omitted Work (no matter how extensive) or misdescribed details of the Work. Any such omitted or misdescribed Work shall be performed as if fully and correctly set forth and described in the technical provisions of the Contract Documents, without entitlement to a Contract Modification hereunder

ARTICLE 39 FORCE MAJEURE

A. Upon providing the County notice and reasonably full particulars of an event of force majeure (as described below) in writing, within a reasonable time after the occurrence of such event of force majeure, the Contractor shall not be liable for any delay or failure to perform to the extent caused by fire, flood, severe weather conditions, explosion, labor disputes, strike, shortage of utilities, compliance with any laws, regulations, orders, acts or requirements from the government, civil authorities, government-mandated facility shutdowns or limitations, acts of God or the public enemy, or any other act or event of any nature reasonably beyond the Contractor's control (a "Force Majeure Event"). In such circumstances, the Contractor is excused from performance until the impact of the Force Majeure Event can be reasonably mitigated. The County may, at its option, elect to cancel or reschedule the portion of any order subject to such delay by providing to the Contractor prompt written notice of its election, provided that, such cancellation or rescheduling shall apply only to that portion of the order affected by the foregoing circumstances and the balance of the order shall continue in full force and effect.

B. The Contractor is expected to request its permits, as applicable, with the permitting agency within a timeframe that will allow the permitting agency its normal processing time to review a permit request. A schedule delay due to the processing time of a permitting agency would only be deemed excusable if the Contractor demonstrated to the satisfaction of the County, through documented evidence, the permitting agency exceeded its standard time to review such permit.

ARTICLE 40 EXTRA WORK

A. The County reserves the right to order changes that may result in additions to or reductions from the amount, type or value of the Work shown in the Contract and which are within the general scope of the Contract, in accordance with this Article. Any such changes, additions or deletions, which result in changes to the Work, will be known as "Extra Work." Additionally, changed conditions other than those described in the Technical Specification, exercising of options, or changed conditions outside of the reasonable control of Contractor will also be deemed Extra Work. The Parties further agree that any changes requested by the County, for the exclusive benefit of the County, shall be also handled in accordance with this Article.

B. Unless an order to perform work is ordered by the Project Manager, no Extra Work shall be performed except pursuant to a written Supplemental Agreement ("Contract Modification" or "Change Order") issued by the County and accepted in writing by Contractor expressly authorizing the performance of such Work and explicitly declaring the intention of the County to treat the Work described therein as Extra Work. In the absence of such a Supplemental Agreement, if the County Project Manager shall direct, order or

require any work, whether orally or in writing, which the Contractor deems to be Extra Work, but shall within five (5) business days of the County Project Manager's written order or directive, give written notice to the County Project Manager stating why the Contractor deems it to be Extra Work. Such notice is required to afford an opportunity to the County to (1) cancel promptly such order, direction or requirement; (2) keep an accurate record of the materials, labor and other items involved; and (3) take such action as may be deemed advisable in light of the Contractor's claim. The failure of the Contractor to give written notice within the time limit stated therefor shall be deemed a conclusive and binding acceptance on the Contractor's part that the direction, order or requirement of the County Project Manager does not involve the performance of Extra Work.

C. Within thirty (30) days of the Contractor's submission of written notice that an order, direction or requirement of the County Project Manager is deemed by the Contractor to involve Extra Work, the Contractor and each Subcontractor shall submit in a form satisfactory to the County a detailed proposal ("Extra Work Proposal")(including the elements of cost identified in Article 41, *Change Order Basis For Extra Work Payment*, Paragraphs A and B) which shall include adjustments to the Contract price, to the extent permitted under Article 41 to the delivery schedule, or to any other provisions of the Contract necessary to accomplish the Extra Work. Upon written request of the Contractor, within the thirty (30) day period set forth above, for good cause shown, the County Project Manager may grant the Contractor additional time in which to submit an Extra Work Proposal. The failure of the Contractor to submit a detailed proposal within the time limit stated therefor, or within such additional time as is granted by the County Project Manager at its sole discretion, shall be deemed a waiver of any claim for compensation that the Contractor may have with respect to the claimed Extra Work.

D. The provisions of the Contract relating to the Work and its performance shall apply without exception to Extra Work and the performance thereof, except as otherwise provided in a written Supplemental Agreement between the Contractor and the County.

E. The Contractor must utilize the most recent updated schedule as required by the Contract to establish the price and schedule modifications. Contractor's Extra Work Proposal must include a schedule subnet, if there is a time impact, and an explanation of the cost, if applicable, and schedule impact of the claimed Extra Work on the Contract. The Contractor must demonstrate clearly how it proposes to incorporate the Extra Work into the schedule. If Contractor fails to notify the County Project Manager of the schedule changes associated with an Extra Work Proposal by submitting a revised schedule, it will be deemed to be an acknowledgment by Contractor that the proposed Extra Work will not have any scheduling consequences.

ARTICLE 41 CHANGE ORDER BASIS FOR EXTRA WORK PAYMENT

A. If Extra Work requires the provision of items of Work or material of the same type as those for which unit prices are identified by the Article titled "Method and Times of Payment", compensation for such Extra Work shall be computed on the basis of the unit price in that article for such items.

B. If Extra Work requires the provision of items of Work or material for which compensation cannot be computed on the basis of unit prices, in accordance with Article 9, *Method and Times of Payment*, and the scope and extent of the Extra Work can be determined before the Extra Work is performed, the County will perform a cost analysis of the Contractor's proposal and negotiate a lump sum amount with the Contractor as compensation for such Work. Upon the occurrence of one of the conditions listed in Article 18(B) for which the Project Manger may issue an oral direction, the County Project Manager may in such case direct the Contractor to proceed with the Extra Work pending performance of the cost analysis and negotiation of the amount of compensation for such Extra Work, subject to the provisions of Article 18(B), *Authority of the Project Manager*. The Contractor shall honor such request so long as it deems the financial risk of doing so to be viable.

ARTICLE 42 WORK PERFORMED WITHOUT INSPECTION

A. At all times before Final Acceptance at each project site, Contractor shall remove or uncover such portions of the finished contracted Work as directed by the County. After examination by the County, Contractor shall restore the Work to the standard required by the Contract Documents. If the Work exposed or examined is not in conformance with the requirements of the Contract Documents, then uncovering, removing and restoring the Work, and recovery of any delay occasioned thereby, shall be at Contractor's cost, and Contractor shall not be entitled to any time extension.

B. Any Work done or materials used without adequate notice to and opportunity for prior inspection by the County, may be ordered uncovered, removed or restored at Contractor's cost and without a time extension, even if the Work proves acceptable after uncovering.

C. If Work exposed or examined under this Article is in conformance with the requirements of the Contract Documents, then any delay from uncovering, removing and restoring Work shall be considered a delay caused by the County, and Contractor shall be entitled to a contract modification for the cost of such efforts and recovery of any delay to the schedule occasioned thereby.

ARTICLE 43 BENEFICIAL USE

A. "Beneficial Use" shall mean: (1) that the Work or relevant portion thereof is not complete, but the Contractor has installed, constructed, and commissioned (tested) the major new equipment and systems (hardware and software, as applicable) included in the Work or relevant portion thereof and (2) the County has taken possession or agreed it can and will use that Work or relevant portion thereof for its intended purpose(s).

B. The County may, upon prior consultation with the Contractor, have Beneficial Use of any completed or partially completed portion of the Work at any stage. Immediately prior to partial Beneficial Use of the Work, the County and the Contractor shall jointly inspect the area to be occupied, as applicable, or portion of the Work to be used in order to determine and record the condition of the Work..

ARTICLE 44 SUBSTANTIAL COMPLETION

A. The Work for each phase shall be deemed Substantially Complete when, as reasonably determined by the County Project Manager, there are no material and substantial variations from the Contract and the Work is fit for its intended purpose. Upon Substantial Completion of each phase, the County Project Manager shall issue a Letter/Certificate/written notice of Substantial Completion. The issuance of this Letter/Certificate shall not relieve the Contractor from its obligation hereunder to complete the Work. Substantial Completion must be achieved sixty (60) days prior to Final Acceptance.

B. When the Contractor is of the opinion that the Work is Substantially Complete, Contractor may submit to the County Project Manager a written request that the County Project Manager inspect the Work so as to determine whether Substantial Completion has been achieved. Upon such request, the County must respond within twenty-five (25) days of its receipt with either (i) a Letter/Certificate of Substantial Completion/written notice of Substantial Completion or (ii) an explanation of the reasons why the Work is not Substantially Complete, including a list of open items necessary to achieve Substantial Completion. Nothing in this Article precludes the County Project Manager from making a determination of Substantial Completion in the absence of a request therefor by the Contractor.

If the County, having substantiated cause, elects not to take possession of the Work upon Substantial Completion, the Risk of Loss remains with the Contractor until the County takes possession of the Work, or relevant portion of the Work ,in accordance with the provisions of either Article 43, *Beneficial Use*, or Article 45, *Final Acceptance*. If the County elects to take possession of the Work upon Substantial Completion or a portion of the Work for Beneficial Use, the transfer of title and Risk of Loss transfer to County upon the earlier of such Substantial Completion or Beneficial Use.

C. The Work remaining after Substantial Completion shall be known as "Punchlist Work." The Punchlist Work shall be limited to minor omissions and defects except the County Project Manager may in their reasonable discretion, include Work which cannot be done until the County, or third persons perform other work which is not the Contractor's responsibility under the Contract provided such County or third-party other work is completed in a timely manner. The County Project Manager shall issue a Punchlist with the Letter/Certificate of Substantial Completion/written notice of Substantial Completion.

D. Upon Substantial Completion, the Contractor shall remove its tools, materials and equipment from the Work Site(s), except for the tools, materials and equipment needed to complete the Punchlist Work, or unless otherwise authorized in writing by the County Project Manager.

ARTICLE 45 FINAL ACCEPTANCE

A. Within ten (10) Days after the Contractor determines that all Work per Phase as required in the Contract, is fully completed, and all required submissions and deliveries to the County specified in the Contract have been made, Contractor shall give the County Project Manager a written Request for Final Acceptance specifying that the Work is completed, the date on which it was completed and stating:

1. All of the Contractor's and Subcontractors' personnel, supplies, equipment, waste materials, rubbish and temporary facilities have been removed from the Worksite(s);

2. Contractor has complied with all requirements associated with closeout of the Contract; and

3. Contractor has delivered to the County Project Manager a Notice of Completion for the Work in recordable form.

B. The County Project Manager shall advise the Contractor of the time reasonably required to complete all the Punchlist Work. The time set by the County Project Manager to complete Punchlist Work shall be no more than sixty (60) days from the issuance of the Letter/Certificate/written notice of Substantial Completion. When in the opinion of the County Project Manager the Punchlist Work is properly completed, the County Project Manager shall issue a Notice of Final Acceptance.

C. In the event of an emergency or if the Contractor fails to diligently perform the Punchlist, the County may complete the Punchlist Work, either by its own forces or by other Contractors. The County's costs thereof will be deducted from the payment due to the Contractor, except that if the County completes the Punchlist Work because of an emergency, then the amount deducted from the payment shall be based on the Contractor's costs for completing the Punchlist Work. If such costs exceed the amount due the Contractor, the Contractor shall immediately upon demand pay such excess to the County.

D. Acceptance of all Work by the County shall occur when in the opinion of the County Project Manager the Work is complete in all respects including any outstanding items contained in the Punchlist provided with the Notice of Completion of the Work. Upon Acceptance the Contractor shall be given a Notice of Final Acceptance for the Phase and the Contractor shall be entitled to invoice the County for Final Acceptance payment milestone outlined in Appendix B.

ARTICLE 46 RESPONSIBILITY TO COMPLETE THE WORK

Notwithstanding any other provision of this Contract that could be interpreted to the contrary (including in Contract Documents of higher precedence), it shall be the Contractor's continuing responsibility to complete and deliver every element, and the integrated whole, of the Work in accordance with all of the requirements of the Contract. The issuance of a Letter/Certificate of Substantial Completion by the County Project Manager for any element, or for the whole of the Work, shall not be construed to relieve the Contractor of this responsibility, or any part thereof. If, after the issuance of a Letter/Certificate of Substantial Completion, the County discovers any deficiency, or item not completed or otherwise requiring correction or remedial action, whether or not the item appears on any Punch List or other list of clean up items, the Contractor shall correct the deficiency, complete the item or otherwise remedy the condition to bring it in to full compliance with the Contract.

ARTICLE 47 DISPUTE RESOLUTION PROCEDURE

A. The Contractor hereby acknowledges that the Project Manager will determine in the first instance all questions of any nature whatsoever arising out of, under, or in connection with, or in any way related to or on account of, this Agreement including without limitations: questions as to the value, acceptability and fitness of the Services; questions as to either party's fulfillment of its obligations under the Contract; negligence, fraud or misrepresentation before or subsequent to acceptance of the Contractor's Proposal or the effective date of this Agreement; questions as to the interpretation of the Scope of Services; and claims for damages, compensation and losses.

B. In accordance with Article 18, *Authority of the County Project Manager*, the Contractor shall promptly comply with every order of the Project Manager, including the withdrawal or modification of any previous order and regardless of whether the Contractor agrees with the Project Manager's determination or order. Where orders are given orally, they will be issued in writing by the

Project Manager as soon thereafter as is practicable.

C. The Contractor must, in the final instance, seek to resolve every difference concerning the Agreement with the Project Manager. In the event that the Contractor and the Project Manager are unable to resolve their difference, the Contractor may initiate a dispute in accordance with the procedures set forth in this Article. **Exhaustion of these procedures shall be a condition precedent to any lawsuit or arbitration permitted hereunder.**

D. In the event of a dispute that cannot be resolved with the Project Manager, the Parties authorize the DTPW Director or designee, who may not be the Project Manager or anyone associated with this Project, acting personally, to decide all questions arising out of, under, or in connection with, or in any way related to or on account of the Agreement (including but not limited to claims in the nature of breach of contract, fraud or misrepresentation arising either before or subsequent to execution hereof) Any such dispute shall be brought, if at all, before the DTPW Director within fifteen (15) business days of the failure to resolve the dispute with the Project Manager.

E. The DTPW Director may base this decision on such assistance as may be desirable, including advice of experts, but in any event shall base the decision on an independent and objective determination of whether Contractor's performance or any Deliverable meets the requirements of this Agreement and any specifications with respect thereto set forth herein. The effect of any decision shall not be impaired or waived by any negotiations or settlements or offers made in connection with the dispute, whether or not the DTPW Director participated therein, or by any prior decision of others, which prior decision shall be deemed subject to review, or by any termination or cancellation of the Agreement. All such disputes shall be submitted in writing by the Contractor to the DTPW Director for a decision, together with all evidence and other pertinent information regarding such questions, in order that a fair and impartial decision may be made. Whenever the DTPW Director is entitled to exercise discretion or judgement or to make a determination or form an opinion pursuant to the provisions of this Article, such action shall be fair and impartial when exercised or taken. The DTPW Director, as appropriate, shall render a decision in writing and deliver a copy of the same to the Contractor. Except as such remedies may be limited or waived elsewhere in the Agreement, Contractor reserves the right to pursue any remedies available under law after exhausting the provisions of this Article.

F. After the DTPW Director renders a decision, if the dispute has not been consensually resolved, then either party may commence arbitration proceedings through the American Arbitration Association ("AAA"). Arbitration proceedings shall be commenced by filing a demand for arbitration (a "Demand") in writing with such body and by simultaneously sending a copy of the Demand to the other Party. The arbitration proceedings shall be governed by and decided in accordance with the rules and proceedings of the AAA governing commercial arbitration in effect at the time of the arbitration (the "Rules"), unless the parties shall mutually agree otherwise in writing. The panel selected shall be a balanced panel, consisting of (1) independent and impartial arbitrator selected pursuant to the Rules in the event the total amount of the Dispute is less than $1 million; or (ii) three (3) independent and impartial arbitrators selected pursuant to the Rules in the event the total amount of the dispute is $1 million or more. The arbitration shall be conducted in English in Miami, Florida, provided that the arbitrator(s) may, for the convenience of the parties and without changing the situs of the arbitration proceedings, permit the taking of evidence outside of Miami. The parties may, by mutual written agreement, specify a different location for the arbitration. The award of the arbitrator(s) may be monetary damages and/or an injunction. In no event may the arbitrator(s) issue an award of any form of exemplary or punitive damages. The fees and expenses of the arbitrator(s) shall be shared equally by the parties and advanced by them from time to time as required. The award rendered by the arbitrator(s) shall be final and binding upon the parties, and judgment may be entered by any competent court having jurisdiction thereof. The award of the arbitrator(s) shall be accompanied by a written explanation of the basis for the award. Notwithstanding anything to the contrary provided in this section and without prejudice to the above procedures, any of the parties may apply to any court of competent jurisdiction for injunctive or other non-monetary judicial relief if such action is necessary to avoid irreparable damage.

G. Notwithstanding the foregoing, as related to any relevant statute of limitations or other filing deadlines, Contractor may file a lawsuit or request arbitration prior to exhausting the dispute resolution procedures of this Agreement if necessary to maintain any claims related to the dispute. The parties agree however, that any such lawsuit or arbitration shall be stayed until the completion of the dispute resolution procedures contained in this agreement.

H. This Article will survive the termination or expiration of this Agreement.

ARTICLE 48 RESPONSIBILITY FOR MAINTENANCE, LOSS AND DAMAGE

A. . It is the Contractor's responsibility to maintain the signalized intersection and equipment prior to its Acceptance. The County is responsible for the operation and maintenance of intersections after Acceptance.

B. Upon the County Project Manager's issuance of a Letter of Acceptance, the County, shall be responsible for the maintenance, loss, or damage to the Work or any element thereof, except as follows:

1. The County Project Manager's issuance of a Letter of Acceptance will not relieve the Contractor of its obligations to complete the Work or any element thereof, the non-completion of which was not disclosed to the County (regardless of whether such nondisclosures were fraudulent, negligent, or otherwise); or

2. The Contractor's action, negligence or breach of this Contract or the warranty causes loss or damage to the Work or any element thereof.

ARTICLE 49 TERMINATION AND SUSPENSION OF WORK

A. This Agreement may be terminated for cause by the County for reasons including, but not limited to, (i) the Contractor commits an Event of Default (as defined below in ARTICLE 50~~Article 50~~) and fails to cure said Event of Default (as delineated below in ARTICLE 51~~Article 51~~), or (ii) Contractor attempts to meet its contractual obligations with the County through fraud, misrepresentation, or material misstatement.

B. This Agreement may also be terminated for convenience by the County. Termination for convenience is effective on the termination date stated in the written notice provided by the County.

C. If County terminates this Agreement for cause under ARTICLE 49~~Article 49~~(a) above, the County may, in its sole discretion, also terminate or cancel any other contract(s) that such individual or corporation or other entity has with the County and that such individual, corporation or other entity shall pay all direct or indirect costs associated with such termination or cancellation, including attorneys' fees.

D. The foregoing notwithstanding, if the Contractor attempts to meet its contractual obligations with the County through fraud, misrepresentation, or material misstatement, the Contractor may be debarred from County contracting in accordance with the County debarment procedures. The Contractor may be subject to debarment for failure to perform and all other reasons set forth in Section 10-38 of the Code.

E. In the event that the County exercises its right to terminate this Agreement, the Contractor shall, upon receipt of such notice, unless otherwise directed by the County:

1. stop Work on the date specified in the notice (the "Effective Termination Date");

2. take such action as may be necessary for the protection and preservation of the County's materials and property;

3. cancel orders;

4. assign to the County and deliver to any location designated by the County any non-cancelable orders for Deliverables that are not capable of use except in the performance of this Agreement and has been specifically developed for the sole purpose of this Agreement and not incorporated in the Services;

5. take no action which will increase the amounts payable by the County under this Agreement; and

6. reimburse the County a proration of the fees paid annually based on the remaining months of the term per the compensation listed in Appendix B.

F. In the event that the County exercises its right to terminate this Agreement, the Contractor will be compensated as stated in the

payment Articles herein for the:

1. portion of the Services completed in accordance with the Agreement up to the Effective Termination Date;

2. non-cancelable Deliverables that are not capable of use except in the performance of this Agreement and has been specifically developed for the sole purpose of this Agreement, but not incorporated in the Services; and

G. All compensation pursuant to this Article are subject to audit.

H. In the event the Contractor fails to cure an Event of Default timely, the County may terminate this Agreement, and the County or its designated representatives may immediately take possession of all applicable equipment, materials, products, documentation, reports, and data.

ARTICLE 50 EVENT OF DEFAULT

A. An Event of Default is a material breach of this Agreement by the Contractor, and includes but is not limited to the following:

1. the Contractor has not delivered Deliverables and/or Services on a timely basis; after written notice same from County;

2. the Contractor has refused or failed to supply enough properly skilled staff personnel;

3. the Contractor has failed to make prompt payment to Subcontractors or suppliers for any Services;

4. the Contractor has become insolvent (other than as interdicted by the bankruptcy laws), or has assigned the proceeds received for the benefit of the Contractor's creditors, or the Contractor has taken advantage of any insolvency statute or debtor/creditor law or if the Contractor's affairs have been put in the hands of a receiver;

5. the Contractor has failed to obtain the approval of the County where required by this Agreement;

6. the Contractor has failed to provide "adequate assurances" as required under subsection B below;

7. the Contractor has failed in the representation of any warranties stated herein; or

8. the Contractor fails to comply with ARTICLE 80~~Article 80~~, *County User Access Program (UAP)*.

B. When, in the opinion of the County, reasonable grounds for uncertainty exist with respect to the Contractor's ability to perform the Work or any portion thereof, the County may request that the Contractor, within the timeframe set forth in the County's request, provide adequate assurances to the County, in writing, of the Contractor's ability to perform in accordance with the terms of this Agreement. Until the County receives such assurances, the County may request an adjustment to the compensation received by the Contractor for portions of the Work which the Contractor has not performed. In the event that the Contractor fails to provide to the County the requested assurances within the prescribed timeframe, the County may:

1. treat such failure as a repudiation and/or material breach of this Agreement; and

2. resort to any remedy for breach provided herein or at law, including but not limited to, taking over the performance of the Work or any part thereof either by itself or through others.

ARTICLE 51 NOTICE OF DEFAULT - OPPORTUNITY TO CURE

If an Event of Default occurs in the determination of the County, the County shall notify the Contractor (the "Default Notice"), specifying the basis for such default, and advising the Contractor that such default must be cured immediately, or this Agreement with the County may be terminated. Notwithstanding, the County may, in its sole discretion, allow the Contractor to rectify the default to the County's reasonable satisfaction within a thirty (30) day period. The County may grant an additional period of such duration as the County shall

deem appropriate without waiver of any of the County's rights hereunder, so long as the Contractor has commenced curing such default and is effectuating a cure with diligence and continuity during such thirty (30) day period or any other period which the County prescribes. The Default Notice shall specify the date the Contractor shall discontinue the Work upon the Effective Termination Date.

ARTICLE 52 REMEDIES IN THE EVENT OF DEFAULT

If an Event of Default occurs, whether or not the County elects to terminate this Agreement as a result thereof, the Contractor shall be liable for actual supported damages resulting from the default, irrespective of whether the County elects to terminate the Agreement.

The Contractor shall also remain liable for any liabilities and claims related to the Contractor's default. The County may also bring any suit or proceeding for specific performance or for an injunction.

ARTICLE 53 WARRANTY

A. Contractor warrants that the Work shall be free of defects in design, material, and workmanship, and shall be fit for use for the intended function, remain in good working order, and shall meet all of the requirements of the Contract.

B. Without in any way limiting Contractor's Warranties with respect to the Work, Contractor shall obtain from all Subcontractors, manufacturers and Suppliers, and assign and deliver to the County all Warranties, including extended Warranties, if applicable, provided by such Subcontractors, manufacturers and Suppliers and from all other persons extending Warranties.

C. All such Warranties shall: a) Survive Partial Acceptance, Substantial Completion, and all the County and Contractor inspections, tests and acceptances, and; b) Shall run directly to and be enforceable by the Contractor and the County.

D. Upon receipt from the County of notice of a failure of any of the Work to satisfy any Subcontractor or Supplier Warranty or other obligation, Contractor shall enforce or perform any such Warranty or other obligation as a part of Contractor's other Warranty obligations hereunder. The County's rights under this paragraph shall continue until the expiration of the later of the Contractor's Warranty (including extensions for rework) or Subcontractor's or Supplier's Warranty or extended warranty. Until such expiration, the cost of any Work (including re-engineering, if applicable) or Equipment (including taxes and shipping) shall be at the sole cost and expense of the Contractor.

E. See Paragraph 2.7(O) of Appendix A (Scope of Work) for additional requirements.

ARTICLE 54 WARRANTY COMMENCEMENT AND DURATION

In accordance with Paragraph 2.07(O) of Appendix A "Scope of Work, warranties shall commence upon the County Project Manager's issuance of a Letter of Acceptance, hereby defined as the Warranty Commencement Date, and shall remain in effect until one (1) year after the Warranty Commencement Date or such longer period as may be specified in the Contract ("Warranty Period"). Subcontractor's, manufacturer's or Supplier's Warranty Periods shall be for the longer of the above stated Warranty Period or the Warranty Period specified in the particular Warranty.

ARTICLE 55 WARRANTY CLAIMS

If the County determines that any of the Work contains a defect any time within the Warranty Period, the County will claim and Contractor shall correct, repair or replace such Work at its sole expense. Contractor shall respond to the County's Warranty claim within one (1) working day, and shall repair the Deficiency within five (5) Days thereafter. If the Deficiency cannot be repaired within said five (5) Days, Contractor, within that five (5) Days, shall submit a schedule for completion of repairs, subject to the acceptance of the County Project Manager, and shall diligently proceed to complete the repairs within the approved schedule. If any defect affects operation of the Work, or any essential element thereof, the County may, in its sole discretion, require Contractor to complete repairs in less than five (5) Days.

ARTICLE 56 WARRANTY ON CORRECTED DEFICIENCIES

Contractor's Warranty shall continue, as to each corrected Deficiency, until the later of:

1. The remainder of the Warranty Period; or

2. One (1) year after Acceptance by the County of any corrected Work.

ARTICLE 57 THE COUNTY RIGHT TO CORRECT DEFICIENCIES

If Contractor fails to remedy Deficiencies or otherwise comply with this Warranty or any other Warranty in this Contract, or fails to propose a timely and adequate remedy, the County, after notice to Contractor, may perform or have performed by Third Parties the necessary remedy, and the costs thereof shall be borne by Contractor.

ARTICLE 58 ACCEPTANCE OF NON-CONFORMING WORK

If the County Project Manager accepts any nonconforming Work without requiring it to be fully corrected, Contractor shall reimburse the County a portion of the Total Contract Price in an amount equal to the greater of:

1. The difference in the value of the Work, plus the present value of additional operating costs, if any, caused by such nonconforming Work; or

2. Contractor's cost savings in not correcting the Work. In either case above, Contractor shall, in addition, reimburse the County's costs to make the determination, including but not limited to staff costs, experts, tests and other actions necessary to make a determination. Such reimbursements shall be payable to the County within ten (10) Days after the Contractor's receipt of the County's demand for payment.

ARTICLE 59 OTHER REMEDIES

The Warranties herein are in addition to all rights and remedies available under the Contract or applicable Law, and shall not limit Contractor's liability or responsibility imposed by the Contract or applicable Law with respect to the Work, including liability for design defects, latent defects, strict liability, negligence or fraud. To the extent that any Warranty from any person other than the Contractor would be voided in whole or part by reason of any act or omission of the Contractor, Contractor shall be fully liable to the extent of said Warranty.

ARTICLE 60 SPARE PARTS

The County's spare parts, if ordered, shall not be used to repair warrantable failures and defects. The security, control, shipping, and disposition of Contractor owned parts shall be the responsibility of Contractor. Damage to the County's property caused by the Contractor shall be the sole responsibility of the Contractor and shall be corrected at Contractor's expense.

ARTICLE 61 REPAIR AND REPLACEMENT

Unless otherwise provided, Contractor shall repair or replace all existing Improvements damaged or removed by Contractor. Repairs and replacements shall be at least equal to Existing Improvements and shall match them in finish and dimension.

ARTICLE 62 MUTUAL OBLIGATIONS

A. This Agreement, including attachments and appendices to the Agreement, shall constitute the entire Agreement between the Parties with respect hereto and supersedes all previous communications and representations or agreements, whether written or oral, with respect to the subject matter hereto unless acknowledged in writing by the duly authorized representatives of the Parties.

B. Nothing in this Agreement shall be construed for the benefit, intended or otherwise, of any third party that is not a parent or

subsidiary of a party or otherwise related (by virtue of ownership control or statutory control) to a party.

C. In those situations where this Agreement imposes an indemnity obligation on the Contractor, the County may, at its expense, elect to participate in the defense if the County should so choose. Furthermore, the County may at its own expense defend or settle any such claims if the Contractor fails to diligently defend such claims, and thereafter seek indemnity for such defense or settlement costs from the Contractor.

ARTICLE 63 QUALITY ASSURANCE/QUALITY ASSURANCE RECORD KEEPING

The Contractor shall maintain, and shall require that its Subcontractors and suppliers maintain, complete and accurate records to substantiate compliance with the requirements set forth in the Agreement. The Contractor and its Subcontractors and suppliers shall retain such records, and all other documents relevant to the Work furnished under this Agreement for a period of three years from the expiration date of this Agreement and any extension thereof.

ARTICLE 64 AUDITS

The County, or its duly authorized representatives and governmental agencies, shall until the expiration of three years after the expiration of this Agreement and any extension thereof, have access to and the right to examine and reproduce any of the Contractor's books, documents, papers and records and of its Subcontractors and suppliers which apply to all matters of the County. Such records shall subsequently conform to Generally Accepted Accounting Principles requirements, as applicable, and shall only address those transactions related to this Agreement.

Pursuant to Section 2-481 of the Code, the Contractor will grant access to the Commission Auditor to all financial and performance related records, property, and equipment purchased in whole or in part with government funds within five business days of the Commission Auditor's request. The Contractor agrees to maintain an accounting system that provides accounting records that are supported with adequate documentation, and adequate procedures for determining the allowability and allocability of costs.

ARTICLE 65 SUBCONTRACTUAL RELATIONS

A. If the Contractor causes any part of this Agreement to be performed by a Subcontractor, the provisions of this Contract will apply to such Subcontractor and its officers, agents and employees in all respects as if it and they were employees of the Contractor; and the Contractor will not be in any manner thereby discharged from its obligations and liabilities hereunder, but will be liable hereunder for all acts, omissions, and negligence of the Subcontractor, its officers, agents, and employees, as if they were employees of the Contractor. The Services performed by the Subcontractor will be subject to the provisions hereof as if performed directly by the Contractor.

B. The Contractor, before making any subcontract for any portion of the Work, will state in writing to the County the name of the proposed Subcontractor, the portion of the Work which the Subcontractor is to do, the place of business of such Subcontractor, and such other information as the County may require. The County will have the right to require the Contractor not to award any subcontract to a person, firm or corporation disapproved by the County.

C. Before entering into any subcontract hereunder, the Contractor will inform the Subcontractor fully and completely of all provisions and requirements of this Agreement relating either directly or indirectly to the Work to be performed. Such Work performed by such Subcontractor will strictly comply with the requirements of this Contract.

D. In order to qualify as a Subcontractor satisfactory to the County, in addition to the other requirements herein provided, the Subcontractor must be prepared to prove to the satisfaction of the County that it has the necessary facilities, skill and experience, and ample financial resources to perform the Work in a satisfactory manner. To be considered skilled and experienced, the Subcontractor must show to the satisfaction of the County that it has satisfactorily performed Work of the same general type which is required to be performed under this Agreement.

E. The County shall have the right to withdraw its consent to a subcontract if it appears to the County that the Subcontractor will delay, prevent, or otherwise impair the performance of the Contractor's obligations under this Agreement. All Subcontractors are required to protect the confidentiality of the County's and County's proprietary and confidential information. Contractor shall furnish to the County copies of all subcontracts between Contractor and Subcontractors and suppliers hereunder. Within each such

subcontract, there shall be a clause for the benefit of the County in the event the County finds the Contractor in breach of this Contract, permitting the County to request completion by the Subcontractor of its performance obligations under the subcontract. The clause shall include an option for the County to pay the Subcontractor directly for the performance by such Subcontractor. Notwithstanding, the foregoing shall neither convey nor imply any obligation or liability on the part of the County to any Subcontractor hereunder as more fully described herein.

ARTICLE 66 ASSUMPTION, PARAMETERS, PROJECTIONS, ESTIMATES AND EXPLANATIONS

The Contractor understands and agrees that any assumptions, parameters, projections, estimates, and explanations presented by the County were provided to the Contractor for evaluation purposes only. However, since these assumptions, parameters, projections, estimates, and explanations represent predictions of future events the County makes no representations or guarantees; and the County shall not be responsible for the accuracy of the assumptions presented; and the County shall not be responsible for conclusions to be drawn therefrom; and any assumptions, parameters, projections, estimates and explanations shall not form the basis of any claim by the Contractor. The Contractor accepts all risk associated with using this information.

ARTICLE 67 SEVERABILITY

If this Agreement contains any provision found to be unlawful, the same shall be deemed to be of no effect and shall be deemed stricken from this Agreement without affecting the binding force of this Agreement as it shall remain after omitting such provision.

ARTICLE 68 PATENT AND COPYRIGHT INDEMNIFICATION

A. The Contractor shall not infringe on any copyrights, trademarks, service marks, trade secrets, patent rights, other intellectual property rights or any other third-party proprietary rights in the performance of the Work.

B. The Contractor warrants that all Deliverables furnished hereunder, including but not limited to equipment, programs, documentation, software, analyses, applications, methods, ways, processes, and the like, do not infringe upon or violate any copyrights, trademarks, service marks, trade secrets, patent rights, other intellectual property rights or any other third party proprietary rights.

C. The Contractor shall be liable and responsible for any and all claims made against the County for infringement of patents, copyrights, service marks, trade secrets or any other third party proprietary rights, by the use or supplying of any programs, documentation, software, analyses, applications, methods, ways, processes, and the like, in the course of performance or completion of, or in any way connected with, the Work, or the County's continued use of the Deliverables furnished hereunder. Accordingly, the Contractor at its own expense, including the payment of attorney's fees, shall indemnify, and hold harmless the County and defend any action brought against the County with respect to any claim, demand, cause of action, debt, or liability.

D. In the event any Deliverable or anything provided to the County hereunder, or portion thereof is held to constitute an infringement and its use is or may be enjoined, the Contractor shall have the obligation to, at the County's option to (i) modify, or require that the applicable Subcontractor or supplier modify, the alleged infringing item(s) at its own expense, without impairing in any respect the functionality or performance of the item(s), or (ii) procure for the County, at the Contractor's expense, the rights provided under this Agreement to use the item(s).

E. The Contractor shall be solely responsible for determining and informing the County whether a prospective supplier or Subcontractor is a party to any litigation involving patent or copyright infringement, service mark, trademark, violation, or proprietary rights claims or is subject to any injunction which may prohibit it from providing any Deliverable hereunder. The Contractor shall enter into agreements with all suppliers and Subcontractors at the Contractor's own risk. The County may reject any Deliverable that it believes to be the subject of any such litigation or injunction, or if, in the County's judgment, use thereof would delay the Work or be unlawful.

ARTICLE 69 CONFIDENTIALITY

A. All Developed Works and other materials, data, transactions of all forms, financial information, documentation, inventions, designs and methods obtained from the County in connection with the Services performed under this Agreement, made or developed by the Contractor or its Subcontractors in the course of the performance of such Services, or the results of such Services, or for which the County holds the proprietary rights, constitute Confidential Information and may not, without the prior written consent of the County, be used by the Contractor or its employees, agents, Subcontractors or suppliers for any purpose other than for the benefit of the County, unless required by law. In addition to the foregoing, all County employee information and County financial information shall be considered Confidential Information and shall be subject to all the requirements stated herein. Neither the Contractor nor its employees, agents, Subcontractors, or suppliers may sell, transfer, publish, disclose, display, license or otherwise make available to others any part of such Confidential Information without the prior written consent of the County. Additionally, the Contractor expressly agrees to be bound by and to defend, indemnify and hold harmless the County, and their officers and employees from the breach of any federal, state, or local law in regard to the privacy of individuals.

B. The Contractor shall advise each of its employees, agents, Subcontractors, and suppliers who may be exposed to such Confidential Information of their obligation to keep such information confidential and shall promptly advise the County in writing if it learns of any unauthorized use or disclosure of the Confidential Information by any of its employees or agents, or Subcontractor's or supplier's employees, present or former. In addition, the Contractor agrees to cooperate fully and provide any assistance necessary to ensure the confidentiality of the Confidential Information.

C. In the event of a breach of this Article damages may not be an adequate remedy and the County shall be entitled to injunctive relief to restrain any such breach or threatened breach. Unless otherwise requested by the County, upon the completion of the Services performed hereunder, the Contractor shall immediately turn over to the County all such Confidential Information existing in tangible form, and no copies thereof shall be retained by the Contractor or its employees, agents, Subcontractors, or suppliers without the prior written consent of the County. A certificate evidencing compliance with this provision and signed by an officer of the Contractor shall accompany such materials.

ARTICLE 70 PROPRIETARY INFORMATION

A. As a political subdivision of the State of Florida, Miami-Dade County is subject to the stipulations of the public records laws of the State of Florida (the "Public Records Law").

B. The Contractor acknowledges that all computer software in the County's possession may constitute or contain information or materials which the County has agreed to protect as proprietary information from disclosure or unauthorized use and may also constitute or contain information or materials which the County has developed at its own expense, the disclosure of which could harm the County's proprietary interest therein.

C. During the term of the Contract, the Contractor will not use directly or indirectly for itself or for others, or publish or disclose to any third party, or remove from the County's property, any computer programs, data compilations, or other software which the County has developed, has used, or is using, is holding for use, or which are otherwise in the possession of the County (the "Computer Software"). All third-party license agreements must also be honored by the Contractor and its employees, except as authorized by the County and, if the Computer Software has been leased or purchased by the County, all hired party license agreements must also be honored by the contractors' employees with the approval of the lessor or Contractors thereof. This includes mainframe, minis, telecommunications, personal computers, and all information technology software.

D. The Contractor will report to the County any information discovered or which is disclosed to the Contractor which may relate to the improper use, publication, disclosure, or removal from the County's property of any information technology software and hardware and will take such steps as are within the Contractor's authority to prevent improper use, disclosure, or removal.

ARTICLE 71 PROPRIETARY RIGHTS

A. The Contractor hereby acknowledges and agrees that the County retains all rights, title and interests in and to all materials, data, documentation and copies thereof furnished by the County to the Contractor hereunder or furnished by the Contractor to the County and/or created by the Contractor for delivery to the County, even if unfinished or in process, as a result of the Services the Contractor performs in connection with this Agreement, including all copyright and other proprietary rights therein, which the

Contractor as well as its employees, agents, Subcontractors and suppliers may use only in connection with the performance of Services under this Agreement. The Contractor shall not, without the prior written consent of the County, use such documentation on any other project in which the Contractor or its employees, agents, Subcontractors, or suppliers are or may become engaged. Submission or distribution by the Contractor to meet official regulatory requirements or for other purposes in connection with the performance of Services under this Agreement shall not be construed as publication in derogation of the County's copyrights or other proprietary rights.

B. All Developed Works shall become the property of the County.

C. Accordingly, neither the Contractor nor its employees, agents, Subcontractors, or suppliers shall have any proprietary interest in such Developed Works. The Developed Works may not be utilized, reproduced, or distributed by or on behalf of the Contractor, or any employee, agent, Subcontractor or supplier thereof, without the prior written consent of the County, except as required for the Contractor's performance hereunder.

D. Except as otherwise provided in subsections a, b, and c above, or elsewhere herein, the Contractor and its Subcontractors and suppliers hereunder shall retain all proprietary rights in and to all Licensed Software provided hereunder, that have not been customized to satisfy the performance criteria set forth in the Scope of Services. Notwithstanding the foregoing, the Contractor hereby grants, and shall require that its Subcontractors and suppliers grant, if the County so desires, a perpetual, irrevocable and unrestricted right and license to use, duplicate, disclose and/or permit any other person(s) or entity(ies) to use all such Licensed Software and the associated specifications, technical data and other Documentation for the operations of the County or entities controlling, controlled by, under common control with, or affiliated with the County, or organizations which may hereafter be formed by or become affiliated with the County. Such license specifically includes, but is not limited to, the right of the County to use and/or disclose, in whole or in part, the technical documentation and Licensed Software, including source code provided hereunder, to any person or entity outside the County for such person's or entity's use in furnishing any and/or all of the Deliverables provided hereunder exclusively for the County or entities controlling, controlled by, under common control with, or affiliated with the County, or organizations which may hereafter be formed by or become affiliated with the County. No such License Software, specifications, data, documentation, or related information shall be deemed to have been given in confidence and any statement or legend to the contrary shall be void and of no effect.

ARTICLE 72 SUPPLIER/VENDOR REGISTRATION/CONFLICT OF INTEREST

A. Supplier/Vendor Registration

The Contractor shall be a registered vendor with the County – Strategic Procurement Department, for the duration of this Agreement. In becoming a registered vendor with Miami-Dade County, the vendor's Federal Employer Identification Number (FEIN) must be provided, via submission of Form W-9 and 147c Letter, as required by the Internal Revenue Service (IRS). If no FEIN exists, the Social Security Number of the owner must be provided as the legal entity identifier. This number becomes Contractor's "County Vendor Number." To comply with Section 119.071(5) of the Florida Statutes relating to the collection of an individual's Social Security Number, be aware that the County requests the Social Security Number for the following purposes:

- **Identification of individual account records**
- **Payments to individual/Contractor for goods and services provided to Miami-Dade County**
- **Tax reporting purposes**
- **Provision of unique identifier in the vendor database used for searching and sorting departmental records**

The Contractor confirms its commitment to comply with the vendor registration requirements and the associated affidavits available in **INFORMS** at https://supplier.miamidade.gov.

B. Conflict of Interest and Code of Ethics

Sections 2-11.1 (c) and (d) of the Code require that any County official, agency/board member or employee, or any member of his or her immediate family who, through a firm, corporation, partnership or business entity, has a financial interest, direct or indirect, with Miami-Dade County or any person or agency acting for Miami-Dade County, competing or applying for a contract, must first obtain and submit a written conflict of interest opinion from the County's Ethics Commission prior to the official, agency/board member or employee, or his or her immediate family member entering into any contract or transacting any business with Miami-Dade County

or any person or agency acting for Miami-Dade County. Any such contract or business transaction entered in violation of these subsections, as amended, shall be rendered voidable. All County officials, autonomous personnel, quasi-judicial personnel, advisory personnel, and employees wishing to do business with the County are hereby advised they must comply with the applicable provisions of Section 2-11.1 of the Conflict of Interest and Code of Ethics Ordinance.

ARTICLE 73 INSPECTOR GENERAL REVIEWS

A. ***Independent Private Sector Inspector General Reviews***
Pursuant to Miami-Dade County Administrative Order No. 3-20, the County has the right to retain the services of an Independent Private Sector Inspector General (the "IPSIG"), whenever the County deems it appropriate to do so. Upon written notice from the County, the Contractor shall make available to the IPSIG retained by the County, all requested records and documentation pertaining to this Agreement for inspection and reproduction. The County shall be responsible for the payment of these IPSIG services, and under no circumstance shall the Contractor's prices and any changes thereto approved by the County, be inclusive of any charges relating to these IPSIG services. The terms of this provision apply to the Contractor, its officers, agents, employees, Subcontractors, and assignees. Nothing contained in this provision shall impair any independent right of the County to conduct an audit or investigate the operations, activities, and performance of the Contractor in connection with this Agreement. The terms of this Article shall not impose any liability on the County by the Contractor or any third party.

B. ***Miami-Dade County Inspector General Review***
According to Section 2-1076 of the Code, Miami-Dade County has established the Office of the Inspector General which may, on a random basis, perform audits on all County contracts, throughout the duration of said contracts. The cost of the audit for this Contract shall be one quarter of one percent (0.25%) of the total Contract amount which cost shall be included in the total Contract amount. The audit cost will be deducted by the County from progress payments to the Contractor. The audit cost shall also be included in all change orders and all Contract renewals and extensions.

C. Exception: The above application of one quarter of one percent (0.25%) fee assessment shall not apply to the following contracts: (a) IPSIG contracts; (b) contracts for legal services; (c) contracts for financial advisory services; (d) auditing contracts; (e) facility rentals and lease agreements; (f) concessions and other rental agreements; (g) insurance contracts; (h) revenue-generating contracts; (i) contracts where an IPSIG is assigned at the time the contract is approved by the Board; (j) professional service agreements under $1,000; (k) management agreements; (l) small purchase orders as defined in Miami-Dade County Implementing Order No. 3-38; (m) federal, state and local government-funded grants; and (n) interlocal agreements. ***Notwithstanding the foregoing, the Miami-Dade County Board of County Commissioners may authorize the inclusion of the fee assessment of one quarter of one percent (0.25%) in any exempted contract at the time of award.***

D. Nothing contained above shall in any way limit the powers of the Inspector General to perform audits on all County contracts including, but not limited to, those contracts specifically exempted above. The Miami-Dade County Inspector General is authorized and empowered to review past, present, and proposed County and Trust contracts, transactions, accounts, records, and programs. In addition, the Inspector General has the power to subpoena witnesses, administer oaths, require the production of records, and monitor existing projects and programs. Monitoring of an existing project or program may include a report concerning whether the project is on time, within budget and in conformance with plans, specifications, and applicable law. The Inspector General is empowered to analyze the necessity of and reasonableness of proposed change orders to the Contract. The Inspector General is empowered to retain the services of IPSIGs to audit, investigate, monitor, oversee, inspect, and review operations, activities, performance and procurement process, including but not limited to project design, specifications, proposal submittals, activities of the Contractor, its officers, agents and employees, lobbyists, County staff and elected officials to ensure compliance with contract specifications and to detect fraud and corruption.

E. Upon written notice to the Contractor from the Inspector General or IPSIG retained by the Inspector General, the Contractor shall make all requested records and documents available to the Inspector General or IPSIG for inspection and copying. The Inspector General and IPSIG shall have the right to inspect and copy all documents and records in the Contractor's possession, custody or control which, in the Inspector General's or IPSIG's sole judgment, pertain to performance of the Contract, including, but not limited to original estimate files, change order estimate files, worksheets, proposals and agreements form and which successful and unsuccessful Subcontractors and suppliers, all project-related correspondence, memoranda, instructions, financial documents, construction documents, proposal and contract documents, back-charge documents, all documents and records which involve cash, trade or volume discounts, insurance proceeds, rebates, or dividends received, payroll and personnel records, and supporting documentation for the aforesaid documents and records.

ARTICLE 74 FEDERAL, STATE, AND LOCAL COMPLIANCE REQUIREMENTS

As applicable, Contractor shall comply, subject to applicable professional standards, with the provisions of all applicable federal, state and the County orders, statutes, ordinances, rules and regulations which may pertain to the Services required under this Agreement, including, but not limited to:

a) Equal Employment Opportunity clause provided under 41 C.F.R. Part 60-1.3 in accordance with Executive Order 11246, "Equal Employment Opportunity", as amended.

b) Miami-Dade County Small Business Enterprises Development Participation Provisions.

c) The Clean Air Act of 1955, as amended, (42 U.S.C. §§ 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. §§ 1251-1387), as amended.

d) The Davis-Bacon Act, as amended(40 U.S.C. §3141-3144 and 3146-3148) as supplemented by the Department of Labor regulations (29 C.F.R. Part 5).

e) The Copeland "Anti-Kickback" Act (40 U.S.C. § 3145) as supplemented by the Department of Labor regulations (29 C.F.R. Part 2).

f) Section 2-11.1 of the Code of Miami-Dade County, "Conflict of Interest and Code of Ethics Ordinance".

g) Section 10-38 of the Code of Miami-Dade County, "Debarment of Contractors from County Work".

h) Section 11A-60 - 11A-67 of the Code of Miami-Dade County, "Domestic Leave".

i) Section 21-255 of the Code of Miami-Dade County prohibiting the presentation, maintenance, or prosecution of false or fraudulent claims against Miami-Dade County.

j) The Equal Pay Act of 1963, as amended (29 U.S.C. § 206(d)).

k) The prohibitions against discrimination on the basis of age under the Age Discrimination Act of 1975 (42 U.S.C. §§ 6101-07) and regulations issued pursuant thereto (24 C.F.R. Part 146).

l) Section 448.07 of the Florida Statutes "Wage Rate Discrimination Based on Sex Prohibited".

m) Chapter 11A of the Code of Miami-Dade County (§ 11A-1 *et seq.*) "Discrimination".

n) Chapter 22 of the Code of Miami-Dade County (§ 22-1 *et seq.*) "Wage Theft".

o) Any other laws prohibiting wage rate discrimination based on sex.

p) Chapter 8A, Article XIX, of the Code of Miami-Dade County (§ 8A-400 *et seq.*) "Business Regulations".

q) Byrd Anti-Lobbying Amendment (31 U.S.C. § 1352).

r) Executive Order 12549 "Debarment and Suspension", which stipulates that no contract(s) are "to be awarded at any tier or to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs".

Pursuant to Resolution No. R-1072-17, by entering into this Contract, the Contractor is certifying that the Contractor is in compliance with, and will continue to comply with, the provisions of items "j" through "o" above.

The Contractor shall hold all licenses and/or certifications, obtain and pay for all permits and/or inspections, and comply with all laws, ordinances, regulations and building code requirements applicable to the work required herein. Damages, penalties, and/or fines imposed on the County or Contractor for failure to obtain and maintain required licenses, certifications, permits and/or inspections shall be borne by the Contractor. The Project Manager shall verify the certification(s), license(s), and permit(s) for the Contractor prior to authorizing

Work and as needed.

Notwithstanding any other provision of this Agreement, Contractor shall not be required pursuant to this Agreement to take any action or abstain from taking any action if such action or abstention would, in the good faith determination of the Contractor, constitute a violation of any law or regulation to which Contractor is subject, including but not limited to laws and regulations requiring that Contractor conduct its operations in a safe and sound manner.

ARTICLE 75 NONDISCRIMINATION

During the performance of this Contract, Contractor agrees to not discriminate unlawfully against any employee or applicant for employment on the basis of race, color, religion, ancestry, national origin, sex, pregnancy, age, disability, marital status, familial status, sexual orientation, gender identity or gender expression, status as victim of domestic violence, dating violence or stalking, or veteran status, and on housing related contracts the source of income, and will take affirmative action to ensure that employees and applicants are afforded equal employment opportunities without discrimination. Such action shall be taken with reference to, but not limited to recruitment, employment, termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on the job training.

By entering into this Contract, the Contractor attests that it is not in violation of the Americans with Disabilities Act of 1990 (and related Acts) or Miami-Dade County Resolution No. R-385-95. If the Contractor or any owner, subsidiary or other firm affiliated with or related to the Contractor is found by the responsible enforcement agency or the County to be in violation of the Act or the Resolution, such violation shall render this Contract void. This Contract shall be void if the Contractor submits a false affidavit pursuant to this Resolution or the Contractor violates the Act or the Resolution during the term of this Contract, even if the Contractor was not in violation at the time it submitted its affidavit.

ARTICLE 76 CONFLICT OF INTEREST

The Contractor represents that:

a) No officer, director, employee, agent, or other consultant of the County or a member of the immediate family or household of the aforesaid has directly or indirectly received or been promised any form of benefit, payment, or compensation, whether tangible or intangible, in connection with the award of this Agreement.

b) There are no undisclosed persons or entities interested with the Contractor in this Agreement. This Agreement is entered into by the Contractor without any connection with any other entity or person making a proposal for the same purpose, and without collusion, fraud or conflict of interest. No elected or appointed officer or official, director, employee, agent, or other consultant of the County, or of the State of Florida (including elected and appointed members of the legislative and executive branches of government), or a member of the immediate family or household of any of the aforesaid:

   i) is interested on behalf of or through the Contractor directly or indirectly in any manner whatsoever in the execution or the performance of this Agreement, or in the Services, Deliverables or Work, to which this Agreement relates or in any portion of the revenues; or

   ii) is an employee, agent, advisor, or consultant to the Contractor or to the best of the Contractor's knowledge any Subcontractor or supplier to the Contractor.

c) Neither the Contractor nor any officer, director, employee, agency, parent, subsidiary, or affiliate of the Contractor shall have an interest which is in conflict with the Contractor's faithful performance of its obligation under this Agreement; provided that the County, in its sole discretion, may consent in writing to such a relationship, provided the Contractor provides the County with a written notice, in advance, which identifies all the individuals and entities involved and sets forth in detail the nature of the relationship and why it is in the County's best interest to consent to such relationship.

d) The provisions of this Article are supplemental to, not in lieu of, all applicable laws with respect to conflict of interest. In the event there is a difference between the standards applicable under this Agreement and those provided by statute, the stricter standard shall apply.

e) In the event Contractor has no prior knowledge of a conflict of interest as set forth above and acquires information which may indicate that there may be an actual or apparent violation of any of the above, Contractor shall promptly bring such information

to the attention of the Project Manager. Contractor shall thereafter cooperate with the County's review and investigation of such information and comply with the instructions Contractor receives from the Project Manager regarding remedying the situation.

ARTICLE 77 PRESS RELEASE OR OTHER PUBLIC COMMUNICATION

Under no circumstances shall the Contractor without the express written consent of the County:

a) Issue or permit to be issued any press release, advertisement or literature of any kind which refers to the County, or the Work being performed hereunder, unless the Contractor first obtains the written approval of the County. Such approval may be withheld if for any reason the County believes that the publication of such information would be harmful to the public interest or is in any way undesirable; and

b) Communicate in any way with any contractor, department, board, agency, commission or other organization or any person whether governmental or private in connection with the Work to be performed hereunder except upon prior written approval and instruction of the County; and

c) Except as may be required by law, the Contractor and its employees, agents, Subcontractors, and suppliers will not represent, directly or indirectly, that any Work, Deliverables or Services provided by the Contractor or such parties has been approved or endorsed by the County.

ARTICLE 78 BANKRUPTCY

The County may terminate this Contract, if, during the term of any contract the Contractor has with the County, the Contractor becomes involved as a debtor in a bankruptcy proceeding, or becomes involved in a reorganization, dissolution, or liquidation proceeding, or if a trustee or receiver is appointed over all or a substantial portion of the property of the Contractor under federal bankruptcy law or any state insolvency law.

ARTICLE 79 GOVERNING LAW

This Contract, including appendices, and all matters relating to this Contract (whether in contract, statute, tort (such as negligence), or otherwise) shall be governed by, and construed in accordance with, the laws of the State of Florida. Venue shall be in Miami-Dade County.

ARTICLE 80 COUNTY USER ACCESS PROGRAM (UAP)

A. User Access Fee

Pursuant to Section 2-8.10 of the Code, this Contract is subject to a user access fee under the County User Access Program ("UAP") in the amount of two percent (2%). All sales resulting from this Contract, or any contract resulting from the solicitation referenced on the first page of this Contract, and the utilization of the County Contract price and the terms and conditions identified herein, are subject to the two percent (2%) UAP. This fee applies to all Contract usage whether by County Departments or by any other governmental, quasi-governmental or not-for-profit entity.

The Contractor providing goods or services under this Contract shall invoice the Contract price and shall accept as payment thereof the Contract price less the 2% UAP as full and complete payment for the goods and/or services specified on the invoice. The County shall retain the 2% UAP for use by the County to help defray the cost of the procurement program. Contractor participation in this invoice reduction portion of the UAP is mandatory.

The line item prices for this contract reflect the application of the UAP. In the event the UAP is determined to not be applicable to this contract, the contractor will provide a 2% discount on their invoices for all items for which a price has been established at the time of award.

B. Joint Purchase

Only those entities that have been approved by the County for participation in the County's Joint Purchase and Entity Revenue Sharing Agreement are eligible to utilize or receive County Contract pricing and terms and conditions. The County will provide to

approved entities a UAP Participant Validation Number. The Contractor must obtain the participation number from the entity prior to filling any order placed pursuant to this Section. Contractor participation in this joint purchase portion of the UAP, however, is voluntary. The Contractor shall notify the ordering entity, in writing, within three business days of receipt of an order, of a decision to decline the order.

For all ordering entities located outside the geographical boundaries of Miami-Dade County, the Contractor shall be entitled to ship goods on an "FOB Destination, Prepaid and Charged Back" basis. This allowance shall only be made when expressly authorized by a representative of the ordering entity prior to shipping the goods.

The County shall have no liability to the Contractor for the cost of any purchase made by an ordering entity under the UAP and shall not be deemed to be a party thereto. All orders shall be placed directly by the ordering entity with the Contractor and shall be paid by the ordering entity less the 2% UAP.

C. **Contractor Compliance**

If a Contractor fails to comply with this Article, that Contractor may be considered in default by the County in accordance with ARTICLE 50~~Article 50~~, *Event of Default*, of this Contract.

ARTICLE 81 INTEREST OF MEMBERS, OFFICERS OR EMPLOYEES AND FORMER MEMBERS, OFFICERS OR EMPLOYEES

No member, officer, or employee of the County, no member of the governing body of the locality in which the Project is situated, no member of the governing body in which the County was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this Contract or the proceeds thereof.

ARTICLE 82 PUBLIC RECORDS AND CONTRACTS FOR SERVICES PERFORMED ON BEHALF OF MIAMI-DADE COUNTY

The Contractor shall comply with the Public Records Laws, including by not limited to, (1) keeping and maintaining all public records that ordinarily and necessarily would be required by the County in order to perform the service; (2) providing the public with access to public records on the same terms and conditions that the County would provide the records and at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes, or as otherwise provided by law; (3) ensuring that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law; and (4) meeting all requirements for retaining public records and transferring, at no cost, to the County all public records in possession of the Contractor upon termination of the Contract and destroying any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements upon such transfer. In addition, all records stored electronically must be provided to the County in a format that is compatible with the information technology systems of the County. Failure to meet any of these provisions or to comply with Florida's Public Records Laws as applicable shall be a material breach of this Agreement and shall be enforced in accordance with the terms and conditions of the Agreement.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT (305) 375-5773, ISD-VSS@MIAMIDADE.GOV, 111 NW 1st STREET, SUITE 1300, MIAMI, FLORIDA 33128.

ARTICLE 83 VERIFICATION OF EMPLOYMENT ELIGIBILITY (E-VERIFY)

By entering into this Contract, the Contractor and its Subcontractors are jointly and severally obligated to comply with the provisions of Section 448.095, Florida Statutes, as amended, titled "Employment Eligibility." The Contractor affirms that (a) it has registered and uses the U.S. Department of Homeland Security's E-Verify system to verify the work authorization status of all new employees of the Contractor; (b) it has required all Subcontractors to this Contract to register and use the E-Verify system to verify the work authorization status of all new employees of the Subcontractor; (c) it has an affidavit from all Subcontractors to this Contract attesting that the

Subcontractor does not employ, contract with, or subcontract with, unauthorized aliens; and (d) it shall maintain copies of any such affidavits for duration of the Contract. Registration information is available at: (http://www.uscis.gov/e-verify)

If County has a good faith belief that Contractor has knowingly violated Section 448.09(1), Florida Statutes, then County shall terminate this contract in accordance with Section 448.095(5)(c), Florida Statutes. In the event of such termination the Contractor agrees and acknowledges that it may not be awarded a public contract for at least one (1) year from the date of such termination and that Contractor shall be liable for any additional costs incurred by the County because of such termination.

In addition, if County has a good faith belief that a Subcontractor has knowingly violated any provisions of Sections 448.09(1) or 448.095, Florida Statutes, but Contractor has otherwise complied with its requirements under those statutes, then Contractor agrees that it shall terminate its contract with the Subcontractor upon receipt of notice from the County of such violation by Subcontractor in accordance with Section 448.095(5)(c), Florida Statutes.

Any challenge to termination under this provision must be filed in the Circuit or County Court by the County, Contractor, or Subcontractor no later than twenty (20) calendar days after the date of contract termination.

ARTICLE 84 HUMAN TRAFFICKING

By entering into, amending, or renewing this Contract, including, without limitation, a grant agreement or economic incentive program payment agreement (all referred to as the "Contract"), as applicable, the Contractor is obligated to comply with the provisions of Section 787.06, Florida Statutes ("F.S."), "Human Trafficking," as amended, which is deemed as being incorporated by reference in this Contract. All definitions and requirements from Section 787.06, F.S., apply to this Contract.

This compliance includes the Contractor providing an affidavit that it does not use coercion for labor or services. This attestation by the Contractor shall be in the form attached as the Human Trafficking Affidavit (the "Affidavit") and must be executed by the Contractor and provided to the County when entering, amending, or renewing this Contract. This Contract shall not be effective unless and until the Contractor executes and provides such attestation.

The Contractor further affirms that if it is found in violation of the required Affidavit, such violation shall render this Contract void. This Contract shall be void if the Contractor submits a false Affidavit pursuant to Section 787.06, F.S., or the Contractor violates Section 787.06, F.S., during the term of this Contract, even if the Contractor was not in violation at the time it submitted its Affidavit.

ARTICLE 85 SURVIVAL

The Parties acknowledge that any of the obligations in this Agreement will survive the term, termination, and cancellation hereof. Accordingly, the respective obligations of the Contractor and the County under this Agreement, which by nature would continue beyond the termination, cancellation, or expiration thereof, shall survive termination, cancellation or expiration hereof.

THE REST OF THIS PAGE HAS BEEN LEFT INTENTIONALLY BLANK

IN WITNESS WHEREOF, the Parties have executed this Agreement effective as of the date identified on the first page of this Agreement.

Horsepower Electric, Inc.	Miami-Dade County
By: M. M.	By:
Name: MICHAEL MARTINEZ	Name: for Daniella Levine Cava
Title: PRESIDENT	Title: Mayor
Date: 9/30/2024	Date:
Attest: Corporate Secretary/Notary Public	Attest: Juan Fernandez-Barquin Clerk of the Court and Comptroller
	By: (Deputy Clerk Signature)
	Print Name:

Corporate Seal/Notary Seal

Approved as to form
and legal sufficiency

Assistant County Attorney

ATTACHMENTS

Appendix A Scope of Work

Exhibit 1 DTPW Division 01 Construction Specifications (General Requirements)
Exhibit 2 Traffic Control Equipment Standards and Specifications Section 600 (General Provisions for Traffic Control Devices)
Exhibit 3 Traffic Control Equipment Standards and Specifications Section 630 (Conduit)
Exhibit 4 Traffic Control Equipment Standards and Specifications Section 635 (Pull, Splice, and Junction Boxes)
Exhibit 5 Traffic Control Equipment Standards and Specifications Section 660 (Vehicle Detection System)
Exhibit 6 Traffic Control Equipment Standards and Specifications Section 671 (Traffic Signal Controllers)
Exhibit 7 Traffic Signal Controller Local Software Functional and Performance Specification
Exhibit 8 Central Traffic Management System Software Functional and Performance Specification
Exhibit 9 System Requirements Matrix
Exhibit 10 Requirements Traceability Matrix
Exhibit 11 System Engineering Documents for Task Group I
Exhibit 12 FDOT District Six - Adaptive Signal Control Technologies (ASCT)
Exhibit 13 Miami-Dade County DTPW Specification Section 527 (Detectable Warnings on Walking Surfaces)
Exhibit 14 Miami-Dade County DTPW Specification Section 110 (Clearing and Grubbing)
Exhibit 15 Signal Intersection Operation Modes (Free - Flash Only)
Exhibit 16 Miami-Dade County Traffic Signal Controller Functions

ADVANCED TRAFFIC MANAGEMENT SYSTEM

TABLE OF CONTENTS

EXHIBITS

Exhibit 1	DTPW Division 01 Construction Specifications (General Requirements)
Exhibit 2	Traffic Control Equipment Standards and Specifications Section 600 (General Provisions for Traffic Control Devices)
Exhibit 3	Traffic Control Equipment Standards and Specifications Section 630 (Conduit)
Exhibit 4	Traffic Control Equipment Standards and Specifications Section 635 (Pull, Splice, and Junction Boxes)
Exhibit 5	Traffic Control Equipment Standards and Specifications Section 660 (Vehicle Detection System)
Exhibit 6	Traffic Control Equipment Standards and Specifications Section 671 (Traffic Signal Controllers)
Exhibit 7	Traffic Signal Controller Local Software Functional and Performance Specification
Exhibit 8	Central Traffic Management System Software Functional and Performance Specification
Exhibit 9	System Requirements Matrix
Exhibit 10	Requirements Traceability Matrix
Exhibit 11	System Engineering Documents for Task Group I
Exhibit 12	FDOT District Six - Adaptive Signal Control Technologies (ASCT)
Exhibit 13	Miami-Dade County DTPW Specification Section 527 (Detectable Warnings on Walking Surfaces)
Exhibit 14	Miami-Dade County DTPW Specification Section 110 (Clearing and Grubbing)
Exhibit 15	Signal Intersection Operation Modes (Free - Flash Only)
Exhibit 16	Miami-Dade County Traffic Signal Controller Functions

1. INTRODUCTION

1.01 PROJECT OBJECTIVE AND OVERVIEW

A. The Traffic Signals and Signs (TSS) Division of the Miami-Dade County Department of Transportation and Public Works (DTPW), hereinafter referred to as the County, seeks a Countywide upgrade of its existing Advanced Traffic Management System (ATMS) and traffic signal controllers; the ability to actuate signalized intersections; and Miscellaneous Engineering Implementation of traffic engineering solutions.

B. The work to be conducted affects operationally active signalized intersections. Design and construction services rendered by the Contractor are intended to result in a complete, functional and operable state of a modernized traffic signal system. Work includes the associated engineering design, technical specifications, permitting, device installation, infrastructure construction, system integration, operational support, training and acceptance testing.

C. Task Grouping

1. Task Group 1 (TG1): Traffic Signal Controller and Local Controller Software

a. This Task Group includes furnish, install and make a signalized intersection fully functional and operational with Caltrans Model 2070LX controller and local controller software. All activities within this Task Group must be completed within five (5) years from the Notice to Proceed (NTP). A minimum of five hundred (500) intersections per year must be upgraded with the new or existing Caltrans Model 2070LX controllers. TG1 implementation is the highest priority work item in the Project budget allocations.

- The furnish and install of the ATMS central software, data migration and integration of the upgraded signalized intersections into the ATMS central software will be performed by the County and/or its assigned representative. This contract contains an option that may be exercised by the County for the delivery of the software and related services.

b. The proposed system (hereinafter referred to as the "System") must include County-approved Caltrans Model 2070LX controllers, local controller software, and a Countywide NTCIP-compliant ATMS software package (optional services) that can communicate using the County's existing communications networks; all meeting the requirements of Article 2.02 of these Technical Requirements.

2. Task Group 2 (TG2): Actuation of Signalized Intersections

a. This Task Group includes the engineering and construction work necessary for adding additional vehicle (including bicycle) and pedestrian detection at signalized intersections to provide for Stop Bar vehicle detection to each travel lanes and pedestrian actuation in order to support actuated signal operations. In addition, this Task Group include the engineering and construction support for adding other types of vehicle detection zones necessary for supporting Task Group 3 deployment of engineering solutions. All activities for this Task Group must be completed within seven (7) years from the Notice to Proceed.

b. It is anticipated that TG2 activities will be deployed approximately at 600 county-road intersections, although the total number of intersections may be increased or decreased by the County.

3. Task Group 3 (TG3): Miscellaneous Engineering Implementation (Optional Services)

a. This Task Group includes engineering services necessary to develop, provide and integrate additional traffic signal operational features and functions that are not specified or proposed as an integral part of the Task Group 1 requirements. This Task Group includes the following specific subtasks: implementing engineering solutions such as, adaptive signal control operations, traffic responsive control operations, updating System Engineering Documents, optimizing existing traffic signal parameters and timing plans to establish the baseline to enable implementation of engineering solutions, and design and development of other miscellaneous operational functions. All activities for this Task Group must be completed within seven (7) years from the NTP.

D. Each of the above Task Groupings must be managed by its task specific task manager with sufficient staff allocated. TG2 deployment activities must follow TG1 deployment activities. No TG2 deployment will be allowed to start unless TG1 deployment is completed at the asset and accepted by TSS. When TSS exercises TG3 (Optional Services), The TG2 deployments must be per the approved TG3 engineering solution on the corridor. TG3 deployment activities must follow TG2 deployment activities. **This scope does not guarantee the executing of all three Task Groups**. **MDC reserves the right to remove any portion or full Task Group at its own discretion.**

1.02 INNOVATION TO GOVERNMENT

The County seeks to identify a cost-effective upgrade path for its existing system that accommodates current needs, extends the lifespan of the system, and provides additional capabilities, such as adaptive signal control and collection of ATSPM. Contractor is encouraged, within the limits of the aforementioned specifications, to offer additional innovative concepts or ideas pertaining to the project approach and cost cutting strategies that would benefit the County in this endeavor.

1.03 EXISTING SYSTEM

A. The DTPW TSS Division operates and maintains over 3,000 signalized intersections on state, county, and local roads within the County's geographical boundaries. The DTPW TSS Division staff monitor and manage the intersections from their Traffic Management Center (TMC) in Miami, Florida. Approximately 1,850 intersections are controlled using the McCain D170E controller, approximately 245 intersections are controlled by the Econolite Safetran Model 2070C controller (a Caltrans Model 2070LX controller), and approximately 820 intersections are controlled by the Yunex Model 2070LX controller. The intersections with D170E controllers are managed using the Kimley-Horn and Associates (KHA) KITS software; the Econolite Safetran Model 2070C controllers are managed by the Econolite Centracs ATMS; the Yunex Model 2070LX controllers are managed using Yunex Traffic Tactics ATMS software. The current KITS ATMS owned by the County does not include full support for the Caltrans Model 2070LX controller.

B. There are approximately 500 signal timing coordination groupings throughout the County. Signals are grouped according to proximity and travel patterns along key arterial corridors (hereinafter referred to as 'Control Sections'). Deployment of the central traffic signal control software, controller hardware and software shall target signalized intersections within signal coordination groups. The remaining traffic signals do not belong to any coordination group but have cellular communication with the central traffic signal control system. These traffic signals operate in actuated and/or semi-actuated, non-coordinated timing patterns 24 hours per day, 7 days per week, and 365 days per year.

C. The County uses specialty controller cabinets designated as Types MD-552A, MD-552X, MD-660A and MD-660X with wiring and functional architecture similar to that of a Caltrans 332 traffic controller cabinet but with minor variations in the cabinet wiring and in the I/O mapping.

D. All signalized intersections maintained by the County provide for per lane vehicle detection on the minor movements (i.e., semi-actuated) with the exception of approximately 10% of the signalized intersections providing per lane vehicle detection for all approaches (i.e. allowing for actuated operations).

E. Network, Server and Communications

1. In order to enhance the integration capabilities, leverage system data for other applications, and facilitate various integration with other systems, the County uses Application Programming Interface (API) technologies.

2. The County's network infrastructure is standardized on Windows Server 2019. A Standard "Class 4" Virtual Machine will consist of a Single CPU, 4GB RAM and 80GB C Drive. These resources can be scaled up if needed up to a 4CPU, 32GB RAM and 400GB total Disk Space Virtual Machine.

3. The County operates an Active Directory infrastructure and all users requiring network resources are assigned a user account. The County requires all application logons and access levels to be integrated with the user's Active Directory account and/or user's group membership. The servers are joined to the Miami-Dade Domain thus permissions will be managed by Lightweight Directory Access Protocol (LDAP) Integration with Active Directory (AD) with the County's Federation Services. This allows for ease of management where the County does not have to manage and maintain two separate systems for application access.

4. MDC currently utilizes DIGI WR21, DIGI WR31, DIGI IX30, and WR44 LTE cellular modems connected via a private AVPN.

F. Transit signal priority (TSP)

1. The County's TSP solution uses on-board TSP devices and a center-to-center application which currently implements communication between its back-office system and the Advanced Traffic Management System (ATMS) to exchange messages relevant to TSP for buses. When a vehicle equipped with an on-board TSP Devices Intelligent Vehicle Network (IVN) reaches a pre-established distance from a TSP-capable intersection on a designated route, provided a set of configurable conditions (such as lateness and direction) are met, the on-board IVN generates a TSP request message (check-in) which travels over the available communication infrastructure to the back-office system. The existing system communicates the TSP request to the ATMS center over an XML web service interface. The ATMS center is responsible for communication with the intersection controller to serve the TSP request based on other external conditions (such as serving pedestrian crossing or a preemption requests). A similar process is followed when the vehicle has cleared the TSP-capable intersection, where the on-board IVN transmits a TSP cancellation message (check-out) to the ATMS center.

2. The TSP business rules for TSP request/cancel messages are defined in the on-board system so that when the conditions are met, the IVN initiates the transmission of the corresponding check-in/check-out messages. Some of the parameters used on these business rules include vehicle location relative to the TSP-capable intersection, schedule deviation, passenger load, door status, vehicle heading and vehicle route. The on-board system requires the vehicle to be in Linear Positioning System (LPS) mode – similar to dead reckoning, to enable the TSP algorithm. To accomplish this, the vehicle Global Positioning System (GPS) needs to be engaged and the doors need to be cycled at the starting point of the TSP- enabled route variation, from this point onwards the system will calculate the distance to the TSP intersections along the route based on the GPS-reported location and the odometer pulses.

3. As referenced above, upon receipt of the TSP check-in/check-out from the vehicle(s), the existing system builds the appropriate XML message(s) and sends it to the ATMS center via a XML message. The XML message includes information such as: intersection asset ID, vehicle ID, vehicle location (lat, long), event time (date/time stamp), event type (request or cancel), route

number and trip direction among others. The existing system captures any event received from the vehicle and any responses from the ATMS center (indicating whether the xml message was received correctly or not) into the system's database for reporting purposes.

G. South Dade Transitway Bus Rapid Transit corridor (BRT)

1. The County's Transit Division is implementing special signal operations for approximately 110 intersections along the South Dade Transitway from Dadeland South Metrorail station to Florida City. This is an ongoing Project. The BRT project is using the Yunex Model 2070LX traffic controllers along with the SEPAC local control software and their Tactics ATMS software for operating the traffic signal system. The project is being developed with elements that include "Light Rail Transit (LRT) style" corridor operations and roadway crossings with gated intersections and a grade crossing warning system at 46 at-grade busway crossings along the Transitway. The gates will be operated by a Siemens NTCIP-compliant controller that is commanded by the traffic signal controller. The project will use Supervisory Control and Data Acquisition (SCADA) software to monitor and operate multiple systems including the gates controller. Buses running on the BRT corridor will be detected in advance via a Global Traffic Technologies Opticom system and a phase selector at the traffic cabinet. The special signal operation at the busway intersections includes a "clear box" check to ensure that the busway is cleared of vehicles prior to serving the buses. The "clear box" detection will be provided via a video vehicle detection system which is also used to provide stop bar detection at the busway intersections. Communication for the traffic controllers at the 46 at-grade busway crossings is being provided via a fiber optics network that is separate from the network that serves the rest of the intersections in the County.

H. Reversible Lane Control System (RLCS)

1. The County uses a Reversible Lane Control System (RLCS) along NW 199 Street to manage lane usage from NW 27 Avenue to NW 2 Avenue during events at Hard Rock Stadium. The RLCS has 22 lane control gantries and uses high speed Ethernet connection for command and status data between the local master controller and central ATMS. The local master controller communicates to each of the gantry controllers. The existing RLCS program (No. 247DA) was developed by McCain, Inc. Program 247DA was designed to take advantage of the HC11 9.8MHz CPU Module as specified by the County during the time of development. The RLCS is currently integrated into the KITS ATMS menu and normally operates on "No Display" mode until another plan is activated.

2. The program shows the current display status and requested mode and has the capability of scheduling events. The Plan Numbers are listed below:
   1) Non-Display (Dark)
   2) Light Inbound
   3) Medium Inbound
   4) Average
   5) Light Outbound
   6) Medium Outbound
   7) Heavy Outbound

3. There are several reports to view the individual communications for each gantry and the status of the system.

2. SCOPE OF WORK

2.01 GENERAL

A. Contractor shall deliver a complete System that will provide the County with the required functionality and workflow process capabilities as detailed in the Scope of Work; actuate all signalized intersections; and provide miscellaneous engineering implementation of traffic engineering solutions. The County requires that the Contractor follow a phased approach to the design, development, and implementation to ensure that a comprehensive and expandable System is implemented during the term of the resulting contract and beyond.

B. When under contract, the Contractor will be responsible for delivering an accepted System to the County which meet the objectives and requirements as stated herein. All systems and services provided under the contract must be in compliance with County, state and federal laws and regulations.

C. Work includes providing the System as specified by the County and all of the professional and construction services needed to meet the requirements of the Contract including project management, engineering design, project initiation and planning, systems integration (optional service), system (hardware and software) delivery and implementation, database conversion and migration (optional service), field installation/construction, testing (validation and acceptance), training, and support.

D. The work plan must address the effective integration and re-use of existing and compatible traffic signal system components including the manner in which existing Model 2070LX controllers, currently deployed at Miami-Dade County intersections, will be reused.

E. This section of the RFP, and the referenced Exhibits provide details on specific requirements, Contractor responsibilities, and other critical information and specifications required for the Contractor to provide a detailed and viable response to the RFP.

F. Within the Scope of Work pertaining to the specific Task Group, the Contractor responsibilities include the preparation of complete, signed and sealed construction documents, which shall comply with all regulatory requirements of the County, State and Federal authorities. Construction documents include detailed signal plan; signal timing plan; preparation of plans and specifications package for all items and areas of work, permitting, standard operation procedures, signal operation plans (SOP), and incidentals to construct the project.

G. Engineering and design development includes verification of existing conditions, vehicle detection system design, traffic signal control data conversion (optional service), permitting and miscellaneous engineering services. The Contractor is responsible for obtaining all applicable permits and approvals required for construction. The Contractor shall be responsible for preparation of shop drawings and other construction submittals. The selected Contractor's Consultant is also responsible for the review and approval of the shop drawings and preparation of signed and sealed as-built plans. Regarding County blanket permit(s); prior to the issuance of any permit, all engineering documents must be provided, reviewed, and approved. Prior to closure or acceptance of any assets under a permit, the permit must be closed. In order to close a permit, all inspections under the permit must be completed. Therefore, the grouping of signals into a signal County permit must take this into account. Further, the County has no authority over the FDOT or Municipalities with regards to their permitting requirements.

H. Except where explicitly stated in the Contract Documents, the project construction activities include furnishing all labor, equipment, materials, integration, testing, construction quality control, with final acceptance by the TSS Division of the project components.

I. Inclusive of all other planning, design, coordination, construction activities and services as required to provide a complete County wide modernized traffic signal control system.

J. Construction activities must be performed in accordance with the requirements of the Contract Documents and include:
   1. Scheduling
   2. Quality Assurance and Quality Control
   3. Bench testing
   4. Maintenance of Traffic (MOT)
   5. Validation and Acceptance testing
   6. Engineer of Record certifications of Completion

K. The requirements in this Section are in addition to the requirements stipulated in the Contract Documents including DTPW Division 01 Construction Specification (Exhibit 1), Traffic Control Equipment Standards and Specifications Section 600 (Exhibit 2), and all other applicable standards and specifications pursuant to the Contract Documents.

L. The Contractor (under the authorization of the County Project Manager) will be responsible for the coordination with multiple agencies including, but not limited to, Miami-Dade County TSS, Miami-Dade IT Department (ITD), Florida Department of Transportation (FDOT), City of Miami, City of Miami Beach, City of North Miami, City of Hialeah, other local municipalities and agencies, AT&T, and Florida Power and Light (FPL).

M. The Contractor must be actively involved and engaged with TSS and CEI during the data migration, pre-deployment testing and integration of the 2070LX traffic controllers to the ATMS central software. The Contractor must coordinate with TSS in a timely manner to ensure all Project related timelines are met. The Contractor must be proactive and discuss all coordination needs as part of the project meetings with TSS and the Construction Engineering and Inspection (CEI). All project related documentation must include the steps where coordination is required.

2.02 TASK GROUP 1: TRAFFIC SIGNAL CONTROLLER AND LOCAL CONTROLLER SOFTWARE

A. This Task Group includes System delivery, migration and integration of all signalized intersections to the County's ATMS Software solution, local controller software, and Caltrans Model 2070LX controllers. The County's signalized intersection contain a number of functions developed over time, that may not be readily available within a single 2070LX controller and local software, as such the County may allow the use and deployment of more than one 2070LX controller and local software.

B. The Contractor must evaluate 2070LX traffic controllers listed in the Florida Department of Transportation (FDOT) Approved Product List (APL), shortlist products that are compatible with the County's proposed ATMS central software, work with the shortlisted product vendors on local controller software related functionality and seek TSS approval of the selected 2070LX traffic controllers and local controller software for deployment. The selected traffic controller vendors must work independently of this Project, with TSS to include the selected vendor products in the Miami-Dade County Qualified Products List (QPL). The following are the key steps in this evaluation process:

   a. Develop an Evaluation Plan for the proposed 2070LX traffic controllers and local controller software and submit to the TSS for review prior to NTP.

   b. The above referenced evaluation plans may include more than one (1) manufacturer and APL listed 2070LX controller model along with their local controller software products that will work with the County's proposed NTCIP-complaint ATMS software.

   c. Work with the proposed manufacturer(s) to ensure that their local controller software will perform all

functions and configurations required to replicate the existing Miami-Dade County traffic signal operations (see section Requirements for Local Controller Software and Controller Hardware). Ensure that the proposed 2070LX traffic controller models utilize one standard I/O Map.

d. Submit the 2070LX traffic controller model(s) along with the respective local controller software(s) with all the required functionalities for TSS review and approval within one hundred and twenty (120) calendar days of NTP. TSS will perform detailed and independent review of the 2070LX traffic controller model(s) and the respective local controller software for compliance to the requirements and provide approval for deployment. All comments from TSS must be resolved by the Contractor prior to deployment of the 2070LX traffic controllers in the field.

e. Ensure all TSS comments are addressed, and the 2070LX traffic controller model(s) and the respective local controller software(s) are ready for Countywide deployment within one-hundred and eighty (180) calendar days of NTP.

f. Preliminary efforts required in support of system delivery and migration include developing and providing the County with an updated Traffic Signal Sections Listing ("Sections Listing). This requires evaluating existing traffic signal section groupings, adding and deleting sections, redistributing intersections, and rearranging the listing as necessary to enhance timing optimization and coordination. The Sections Listing must support the subtask activities required of Task Group 3. A draft report including the description of grouping criteria and the updated Sections listing must be provided to the County within 90 days after the Notice to Proceed. (Optional Services)

C. Requirements for ATMS, Local Controller Software and Controller Hardware:

1. Only products that meet the following requirements will be considered:

a. Traffic signal controller hardware

1) Each traffic signal controller must be a Caltrans Model 2070LX controller unit that meets the requirements of Section 671 (Traffic Signal Controllers) of the Miami-Dade County Traffic Control Equipment Standards and Specifications provided as Exhibit 6 to these Technical Requirements.

b. Local signal controller software

1) Meet the requirements of the Miami-Dade Traffic Signal Controller Local Software Functional and Performance Specification provided as Exhibit 7 and Exhibit 9 System Requirements Matrix to these Technical Requirements.

2) The local signal controller software must provide the following functions used in MDC. In addition, the Contractor must work with the local controller software vendor in developing newer functions or updates to existing functions over the duration of the Project.

Functions
Overlaps, >1 Overlap Set, Negative Pedestrian Overlap
Leading Pedestrian Interval (LPI)
Pedestrian Sync Phases
Lead/ Lag Phases
Ped 6 Actuated Only in Phase 6 & Phase 2
Ped Call Phase 1 and 5
Detector Logic to Call Lift, Call Lifting / Omit Phase
Exclusive Phase
Local Preemption, Preempt & Warning Flasher

Remote Preemption
Exclusive / Concurrent Pedestrian Operation (Dual Mode) by Time of Day
Blank Out Sign (Prepare to Stop)
Blank Out Sign (No Right Turn)
Advanced Warning Beacon
Protected Only Protected Permissive (POPP) (Only on One Approach), POPP (Multiple Approaches)
Diamond Interchange
Diverging Diamond Interchange (DDI)
Split Ring Operation
HAWK Signal / Flashing Pedestrian Signal
Vehicle Pretimed – Split phase, Actuated P4 served in Phase 3 or Phase 4
NBLT (5-sec) Independent Operation From NBT
Flashing Yellow Arrow (FYA)
Reservice Phases
Roundabout – 4 Signalized Pedestrian Crossing
South Dade Transitway
Hard Rock Stadium – Reversible Lane Control System

The Contractor must meet the requirements provided in Exhibit 16 Miami-Dade County Traffic Signal Controller Functions.

3) All functions should be performed by the local controller software only. Peer-to-peer functionality or other third-party communications and means are not allowed on this Project.

4) The Contractor must provide programming guidelines for all the functions.

5) The traffic controller operation must transition (switching between one signal timing plan to another) without any issues while functions are activated.

6) The preferred mode of operation in Miami-Dade County is Yield Mode. In Yield Mode, the controller at the yield point will seek to serve the next phase in the sequence that has a call. The coordinated phase begins to terminate to the clearance intervals and the next phase will turn green based on demand. If there is no demand on any of the phases, the cycle would continue in the coordinated phases. In yield mode, the coordinated phase pedestrian must be able to have pedestrian dwell and/or actuated pedestrian movements.

7) The controller software must have the capability to reject or give a warning message in case the programmed values of controller settings violate MUTCD and MDC standards. The following use-cases below should trigger a "Warning" message if not properly configured:
   a. Permitted phases are missing minimum green times.
   b. Permitted phases are missing yellow or red times.
   c. Either the Walk or FDW is populated, and the other value is set to zero. If a value exists where Walk or FDW is >0, then both values must have a value > 0.
   d. Minimum Split Requirement is not met. Minimum Split must be at least the summation of Min Green + Yellow + Red.
   e. The pedestrian time exceeds split time.
   f. The offset value is greater than the cycle length.
   g. Summation of splits in ring 1 do not equal the cycle length.
   h. The scheduled action/pattern does not have timing parameters programmed (i.e. coord settings, cycle length, splits, and offset)

8) For all local control software version deployments, the Contractor shall provide the following related software release documentation, as applicable:
   a. Compatibility Information: Specify which hardware and other software versions the new

release is compatible with. This helps in ensuring that all components of the ATMS work seamlessly together after the update.

b. Performance Improvements: Detail any enhancements that improve the software's efficiency, response time, or reduce resource consumption. This can help stakeholders understand the benefits of each release beyond just new features or bug fixes.
c. Security Enhancements: Beyond listing critical security updates, describe any improvements made to the software's security posture, such as enhanced encryption or better access controls. Given the critical nature of ATMS in public safety, highlighting these improvements is essential.
d. Feature Deprecations: Clearly state if any features are being deprecated or are planned for deprecation in future releases. This allows users to prepare for changes or seek clarifications on alternative functionalities.
e. API Changes (if applicable): For systems that integrate with other city infrastructure or third-party applications, detailing any changes to the Application Programming Interfaces (APIs) is crucial. This includes new APIs, deprecated APIs, or changes to existing API contracts.
f. User Interface Changes (if applicable): If the release includes changes to the user interface, providing screenshots or descriptions of these changes to help users adjust more quickly.
g. Detailed Test Reports: Including test reports or summaries of testing phases to provide confidence in the new release's reliability and functionality.
h. Known Limitations: While similar to known bugs, this specifically should address any limitations of the software that are not classified as bugs but could impact its use or integration.
i. Customer Support Information: Update contact information or procedures for getting support, especially if there are significant changes in the release that may lead to increased support requests.
j. Feedback Mechanism: Describe how users can provide feedback on the new version to help plan future updates.

9) The 2070LX traffic controller and the local controller software must be:
   a. Capable of providing a second-by-second controller data to support the live signal operations.
   b. Capable of processing and transmitting Hi-Resolution (Hi-Res) Data. TSS has full rights to the Hi-Res data and the Contractor cannot sell data, copy, or use Hi-Res data for any other activities. All data generated by the Project components shall belong to TSS and no other entity has any right to use the data for any purpose.
   c. Automatic error logging identification needs to be set up within the software and not use any third-party software products.

10) To support with the integration of the 2070LX traffic controllers to the ATMS central software, for proposed 2070LX traffic controller model(s), the Contractor must provide the following items to TSS which includes, but is not limited to:
   a. Provide access to available MIBs (including “private” objects) and updated firmware manuals/user guides.
   b. Provide selected test controllers that matches the hardware and firmware that are to be deployed in the field.
   c. Provide virtual controller/emulator companion software’s to allow for more robust testing and remote front panel access.
   d. Provide IO mapping and logic editor, and development tools.
   e. Provide utility/process for remotely pushing out firmware updates.
   f. Provide contact and method for reporting and tracking bugs.
   g. Provide controllers software releases and patches.

c. ATMS central software (Optional Services)

This Section is Optional. The County may exercise the option for these services and direct the Contractor to provide these services as described below:

1) Meet the requirements of the Miami-Dade Central Traffic Management System Software Functional and Performance Specification provided as Exhibit 8 and Exhibit 9 System Requirements Matrix to these Technical Requirements.

2) All features identified from the proposed Systems Requirements Matrix (Exhibit 9), are required at the time of partial acceptance of the software. Partial Acceptance of the full software must occur within six (6) months from NTP and is a mandatory condition for the Contractor to meet prior to the start of the traffic controller installation. Final Acceptance of the full software must occur within one (1) year from NTP. The ATMS central software must be bug-free, stable and operate at a minimum of 200 of the 2070 LX traffic controllers during the time between partial acceptance and final acceptance dates without any issues.

3) The ATMS central software must support operating of the existing Caltrans 2070LX controllers and local controller software solutions from Econolite and Yunex systems that are part of the MDC traffic signal system.

4) The ATMS central software must at a minimum provide all the existing functionality except interfacing with 170 controllers, features, and reports that are available to TSS from the legacy ATMS (i.e., KITS, Centracs and Tactics). It is understood that during the execution of the project, updates to the ATMS central software might be required to provide latest industry standard functionality. The Contractor must coordinate with TSS and update the software version in a phased approach and the software update schedule must be approved by TSS.

5) The ATMS central software must at a minimum provide the following visualization features:

   a. Signal Health Dashboard Visualization

   b. Detector Health Dashboard Visualization

   c. HIT Report

   d. Space Diagram

   e. Summary (with the capability to modify splits, cycle lengths, and offsets)

   f. Comm. Status

   g. Manual Control Summary

   h. Communications Failure

   i. System Status

   j. Controller current time

   k. Controller time Sync

   l. Live "toast notifications" or pop-up alerts

6) The ATMS central software must provide a scratchpad and future timing features that creates a temporary file to support users to propose changes to timing plans and other controller database pages to TSS without making actual changes to the main database that is running in the field. Once approved by TSS, the timing parameters in the scratchpad and future timing feature must be able to be copied into the main database.

7) The ATMS central software must at a minimum provide the following control and command functionality:

a. Central Commands
b. Special Events
c. Manual Plan
d. Bridge Preemption
e. Quick Commands
f. Reset Conflict Monitors
g. Command Mode: Timing Plan, Free Mode and Flash Mode

8) The ATMS central software must at a minimum provide the following miscellaneous functionality:
   a. Dashboard view for FDOT (conflict)
   b. Dashboard view for Waze (conflict & bridge preemption)
   c. Laptop operating mode
   d. RLCS operating mode
9) The ATMS central software must at a minimum provide the following existing KITS and Centracs reports:
   a. Batch Compare
   b. Communications Statistics Detailed Report
   c. Manual Control Summary Report
   d. Event Log Report
   e. User Activity Report
   f. Communication Failure Report
   g. Controller Preemption Summary Report
   h. Phase Malfunction Report
   i. System Status Report
   j. TOD Schedule Report
   k. Communications Statistics Summary Report
   l. Scratch Timing Report
   m. Manual Command Log
   n. Pending Approval Report
   o. Communication Failure Detail Report
   p. Acknowledged Alerts Report
   q. Arterial Green Report
   r. Disabled Controller Report
   s. Route Preemption Summary Report
   t. Coordination Failure Report
   u. Engineer's Productivity Report
   v. Transit Signal Priority Report

w. Arterial Section/Schedule Report

x. Historical Intersection Timing Report

y. Measures of Effectiveness (MOE) Report

10) For all ATMS central software version deployments, the Contractor must provide a System Change related documentation that includes the following key attributes:

a. Description of Change

b. Service Impact

c. Implementation Plan/Action Plan

d. Rollback/Contingency Plan

e. Close-out Comments

11) The Contractor must coordinate with Miami-Dade County Information Technology Department (ITD) and obtain all required ITD procedures to be followed for the Project. The Contractor must complete the ITD's Change Management Form (FM-PR-IT-023) to document and request support for system upgrades or changes. This form must be routed via ITD change management process.

12) The Contractor must closely coordinate with ITD for submitting all IT design related documentation and getting ITD's approval prior to all stages of the deployment/implementation of all hardware and software related components. No work shall begin until required ITD approvals are obtained.

13) For all ATMS central software version deployments, the Contractor must provide the following related software release documentation:

a. Compatibility Information: Specify which hardware and other software versions the new release is compatible with. This helps in ensuring that all components of the ATMS work seamlessly together after the update.

b. Performance Improvements: Detail any enhancements that improve the software's efficiency, response time, or reduce resource consumption. This can help stakeholders understand the benefits of each release beyond just new features or bug fixes.

c. Security Enhancements: Beyond listing critical security updates, describe any improvements made to the software's security posture, such as enhanced encryption or better access controls. Given the critical nature of ATMS in public safety, highlighting these improvements is essential.

d. Feature Deprecations: Clearly state if any features are being deprecated or are planned for deprecation in future releases. This allows users to prepare for changes or seek clarifications on alternative functionalities.

e. API Changes: For systems that integrate with other city infrastructure or third-party applications, detailing any changes to the Application Programming Interfaces (APIs) is crucial. This includes new APIs, deprecated APIs, or changes to existing API contracts.

f. User Interface Changes: If the release includes changes to the user interface, providing screenshots or descriptions of these changes to help users adjust more quickly.

g. Detailed Test Reports: Including test reports or summaries of testing phases to provide confidence in the new release's reliability and functionality.

h. Known Limitations: While similar to known bugs, this specifically should address any limitations of the software that are not classified as bugs but could impact its use or

integration.

i. Customer Support Information: Update contact information or procedures for getting support, especially if there are significant changes in the release that may lead to increased support requests.

j. Feedback Mechanism: Describe how users can provide feedback on the new version to help plan future updates.

14) Other key features of the ATMS central software must be:

a. Able to clearly and accurately support visualization of all MDC's local controller software functions.

b. Capable of providing a second-by-second controller data to support the live signal operations. The Contractor's ATMS central software IT infrastructure must support the above second-by-second controller data polling.

c. Capable of receiving and processing Hi-Resolution (Hi-Res) Data from the existing 2070 LX controllers and future 2070LX controllers. TSS has full rights to the Hi-Res data and the Contractor cannot sell data, copy, or use Hi-Res data for any other activities. All data generated by the Project components shall belong to TSS and no other entity has any right to use the data for any purpose. The Contractor shall prepare and submit a Hi-Res Data Usage Plan to TSS for review and approval. The Hi-Res Data Usage Plan must discuss the data storage needs (e.g., on-premises or cloud computing) retrieval methodology (e.g., ease of access and retrieval) and usage (e.g., ATMS central software functionality and reports) during the Project's design phase.

d. Automatic error logging identification must be set up within the software and not use any third-party software products.

e. The software services and servers in pre-production and production stage must not have reboots without explicit approval from TSS and ITD. For all reboots, the Contractor must enable Windows server feature requiring user to document reason for restart prior to restarting the server. Considerations for alternatives must be approved by ITD in advance and Contractor must follow industry standards for logging and reporting events.

f. Support remote reset of traffic detection using the ATMS central software.

g. Support remote rest of controller during flash operations using the ATMS central software

h. Support the signal coordination grouping as required by TSS.

15) Integration of 2070LX Traffic Signal Controllers into ATMS Central Software

The Contractor must provide all the required support related to the integration of the new 2070LX traffic controllers to the proposed ATMS central software.

D. Data Conversion and Migration [Optional Service]

This Section is Optional. The County may exercise the option for these services and direct the Contractor to provide these services as described below:

1) Prior to the installation of the new traffic signal controllers, the Contractor must convert existing signal timing databases to the format specific for the new local controller software. The conversion must ensure proper clearance intervals that complies with MUTCD and FDOT Traffic Engineering Manual (TEM) requirements and safe signal operations; and maintain the same signal operational functions as the existing signal controllers.

2) The Contractor must develop and use a conversion tool to support data migration from existing

ATMS database(s) to the new ATMS database. The conversion tool must automate the data migration process and minimize any manual data entry. The conversion tool must be provided to TSS once it is developed and tested for use. The Project CEI may use the conversion tool for testing purposes.

3) The Contractor must develop and submit to TSS for review and approval the following documentation for data migration:
   - Controller timing sheets
   - Database
   - Migration notes
   - SOP

4) The Contractor must perform re-calculation of preemption values using the latest FDOT TEM.

5) The Contractor must plan and evaluate assets for oversized pedestrian crossings when deploying the new 2070LX controller. The Contractor must review the existing MDC SOP documentation and make updates as required to match the new pedestrian interval option that is planned for the Project. Cycle lengths and splits for a particular asset or entire coordinated section must be re-evaluated and modified prior to migration. The Contractor must document all changes and submit to TSS for review and approval.

6) The Contractor must coordinate with the 2070LX controller vendor to plan and develop the type and transition of the pedestrian interval. The Contractor must consider the impacts to pedestrian and driver expectations because of the new proposed changes. The Contractor must coordinate with TSS and other local agencies and seek approval of all changes prior to data migration and implementation.

7) A maximum of six (6) week controller database freezing period will apply so that the Area Engineer or other TSS staff will not change the database from the time the initial database and documentation is issued to the Contractor for data migration efforts unless the change is required to address a safety issue. However, if there is a time delay of more than six (6) weeks between the initial data migration efforts and the actual deployment, the Contractor must rework on the data migration aspect to ensure that the correct version is migrated. The Contractor must rework the data migration aspect for cases when TSS makes changes to the database to address safety related issues.

8) The Contractor's team must follow the approved pre-deployment test checklists and procedures, and system configuration checklists and procedures.

9) A controller will be considered ready for installation upon successful pre-deployment test and approval of signed and sealed documents.

E. Controller Installation

1) Upon TSS approval of configuration of traffic controller software functions or within one hundred and eighty (180) days of NTP whichever occurs first, the Contractor shall coordinate with TSS and Project CEI to identify a demonstration corridor or demonstration sites (spread across the Miami-Dade County) for testing the new 2070LX traffic controllers and their respective local controller software.

2) The demonstration corridor or demonstration sites shall provide sufficient coverage of varying existing conditions, varying age of infrastructure, varying functions, and other characteristics deemed required by TSS to test the new system. The Contractor will deploy the new controllers and local controller software's to demonstrate a fully functional and operational system prior to

full scale deployment of the traffic controllers. The Contractor shall conduct full scale testing of system components to ensure that there are no issues and system operates error-free e.g., logical grounding issue, input/output (IO) module issue, etc. and the new system is compatible with the existing conditions of the MDC traffic signal system. The demonstration shall also test and verify that all the functions that are currently being used in Miami-Dade County are replicated in the field, ensure that there are no data gaps, new infrastructure works in the MDC environment and with the existing cabinet connections and others. The demonstration duration must be conducted for at a minimum of ninety (90) days. The demonstration must be completed successfully within three hundred and sixty five days (365 days) of NTP.

3) The Contractor must complete the installation of controllers following the Controller Deployment plan (see section System Configuration) which requires completion of one full Control Section before moving to the next Control Section. The Contractor must group the intersections located at interchanges or using functions together when planning the installation to maintain current signal operations. This work shall include the installation of new traffic signal controllers in an existing controller cabinet and reuse of existing Model 2070LX controllers, currently deployed at Miami-Dade County intersections.

4) The Contractor must participate in the bench testing and provide concurrence for field deployment to TSS. Upon the Contractor's concurrence, TSS will release the controllers ready for installation.

   Prior to the installation work at each intersection,

   a. The Contractor must develop field deployment checklist and test procedures to be submitted to the County for review and approval. The Contractor must use the approved checklist as a required QA/QC step to ensure the proper and safe operation of the controller database when deployed.

   b. The Contractor's team must have performed a thorough field investigation service at that location to verify intersection operation and identify any deficiencies or issues. The Contractor must provide a TG1 field survey report for every asset for TSS review and records. Any deficiencies must be noted and addressed prior to installation of the new equipment. The field investigation surveys must be no more than three (3) months ahead of the database migration and controller deployment schedule. The Contractor must review the condition of the existing traffic controller cabinet before installation and identify anything that may adversely impact the operations of the new traffic controllers.

   c. The Contractor must prepare and submit documentation to TSS for review and approval that provides details of existing conditions, discussion of the issues, tests performed by the Contractor in determining the issue, proposed modifications by the Contractor, any impacts to system due to modification including warranty of the cabinet, among other items. Once TSS provides the approval to the modifications, the Contractor must modify the cabinet.

   d. The Contractor must check and ensure that the migrated database into the new traffic controller matches the existing controller database in the field at the time of deployment. If the database doesn't match, the Contractor cannot proceed with the installation without coordinating with TSS.

   e. Any changes to database must be saved by the data key automatically. No controller will be allowed for deployment if this functionality is not ready. Local controller software should allow users to remotely save to the data key as well.

5) The Contractor must install the controllers only during non-peak hours, non-holidays, during nighttime and weekends when the impacts to public are at a minimum. No lane closures are allowed for traffic controller replacement.

6) During the controller installation, the Contractor will perform the field deployment procedure and complete the field deployment checklist.

7) After completion of traffic controller installation, the Contractor must check and verify the coordination between intersections across differing systems (New 2070LX traffic controller vs Yunex/Econolite/McCain) are as per the below criteria:
    - Verify new traffic controller clock is synced with the Miami-Dade County's network clock.
    - Verify that the new traffic controller is receiving at least daily time updates by checking for Remote Time updates on the controller alarms.
    - Verify that the cycle lengths at all patterns of the new traffic controller matches the cycle length (or double/half if that is the intended operation) of the corresponding pattern of the neighboring coordinated intersections.
    - Verify that the addition of all the splits on the governing ring at all patterns add up to the desired cycle lengths.
    - Verify that the new traffic controller sync clock is synchronized with the neighboring controller sync clock.
    - Verify that the coordinated event (e.g., end of yellow, start of green, etc.) matches the intended coordination design.
    - Verify the above steps using a stopwatch. Measure the time between the start of the coordinated events of the two intersections. The measured time should match the difference in offsets between the intersections. Stopwatch measurement should start at the beginning of the coordinated event at the intersection with the lowest offset value.

8) Upon the start of deployment and prior to County acceptance of the intersection, the Contractor shall be responsible for maintenance of the intersection and must respond to all trouble calls and provide a report documenting findings and corrective actions.

F. This Task Group includes updating the Systems Engineering Documents provided as Exhibit 11 (System Engineering Documents for Task Group 1). (Optional Services)

G. Traffic Controller Expert Staff

1. This Task Group includes providing on-site controller expert staff. The Contractor will maintain a total of two full-time support staff with traffic controller and local controller software expertise in the TMC during the term of the contract commencing with the start of the project. The staff will assist the County in transitioning of the controllers from the existing system to the new one. **These staff are not to be utilized for other Project activities. The two (2) full-time personnel must be considered as an extension of TSS personnel and must respond and report to TSS designated supervisor.** Furthermore, the Contractor must maintain on-call personnel to offer support outside of regular business hours, including weekends, holidays, special events, and during and after natural disasters.

    a. The controller expert staff must have the following qualifications:

        1) At least seven (7) years of experience with traffic controllers and local controller software operations.

        2) IMSA Traffic Signal Sr. Field Technician III Certification

    b. The controller expert staff duties and responsibilities will include:

        1) Programming of traffic signal controllers to download/upload and modify signal timing plans.

        2) Perform independent investigations of written concerns raised from internal and external sources, regarding traffic controller operations and respond within correspondence guidelines.

3) Provide and conduct training / transfer of knowledge to the Miami-Dade County TSS Staff.

4) Demonstrate ability to communicate complex issues in plain language verbally and in writing in the English language.

5) Develop standard operating guidelines, standard operating procedures and other technical documents.

6) Develop, review, and test new and/or modified traffic signal timing database, as well as evaluation of special operations.

7) Test and troubleshoot the traffic controller and local controller software. Identify and evaluate issues and provide solutions to rectify issues.

8) Develop test plans and procedures as related to traffic controller and local controller software operations and maintenance.

9) Develop standardized configurations for new functions and traffic signal operations for the local controller software.

10) Understand the existing MDC TSS cabinet configuration and develop standardized cabinet configurations for new functions and traffic signal operations. Assist TSS maintenance staff to perform updates of existing cabinets to make them standardized cabinet configurations.

c. The controller expert staff will be assigned to the County to perform the following day-to- day duties:

1. Document potential issues and identify root cause.
2. Resolve issues and track to completion.
3. Provide formal and ad-hoc training for the new traffic controllers and local controller software.
4. Provide local testing of new databases and validate operations in the field.
5. Perform testing and configuration services for the deployed controllers and local controller software.
6. Provide detailed reports and be able to close the Enterprise Asset Management System (EAMS) tickets within the stipulated time (e.g., 4 hours of issue resolution).
7. Provide technical support and recommendations to TSS to address citizen complaints.

2. The controller expert staff must have in-depth knowledge of the traffic controller and local controller deployed in this project and be capable of immediately resolving issues. The staff must support TSS with verification of testing performed by others and participate in the project as a technical expert.

3. The controller expert staff will be for the contract term with an expected outcome that the knowledge and expertise of the staff will be transferred to staff designated by the County. To measure the success of this knowledge transfer, the staff will develop testing exercises. The designated County staff will be asked to take and pass these exercises to provide assurance to the County that their staff has been competently and effectively trained.

H. Local Controller Software Maintenance Support:

1. This Task Group includes providing software maintenance support during the term of the contract commencing with the start of the project. Software maintenance support includes, but is not limited to, remote technical support and assistance resolving any defects or bugs in the local controller software system and entitles the County to software upgrades. For issues requiring a deeper level of technical support, expert personnel are expected to assist with diagnostics and troubleshooting for the resolution of any software issues.

I. ATMS Central Software Maintenance Support (Optional Services):

1. This Task Group includes providing software maintenance support during the term of the contract commencing with the start of the project. Software maintenance support includes, but is not limited to, remote technical support and assistance resolving any defects or bugs in the ATMS central software system and entitles the County to software upgrades. For issues requiring a deeper level of technical support, expert personnel are expected to assist with diagnostics and troubleshooting for the resolution of any software issues.

J. Existing Site Conditions (TG1):

1. The Contractor acknowledges that all signalized intersections were built to the applicable standards at the time of their construction, but do not necessarily meet the most current standards for new signalized intersections. Further, the Contractor acknowledges that the existing equipment, not identified as damaged or failing in the pre installation site surveys, is operating in a state of good repair and is fully functioning in its intended capacity, and that all work required for installation and proper functionality of the Contractor's new equipment shall be provided at no additional charge to the County.

2.03 TASK GROUP 2: ACTUATION OF SIGNALIZED INTERSECTIONS

A. The County seeks, through this Task Group, the engineering and construction services necessary to actuate signalized intersections (add per lane vehicle detection for all approaches) based on the following requirements:

1. Field surveys for each project intersection must be conducted to assess the condition of existing detection equipment and determine additional detection (vehicle, pedestrian and bicycle) needs for the implementation of Task Group 3 solutions. A Detection Placement Assessment Report documenting the findings of the field survey and proposed detection requirements must be submitted to the County for approval 90 days prior to initial plans submittal.

2. Each intersection requires site-specific design and engineering plans submitted for County approval. Preparation of site-specific intersection design must consider existing detection and infrastructure and provide the most cost effective solution that can provide for actuated intersection signal operations. If actuating the signalized intersection triggers a Signal Operations Plan (SOP) change, then the Contractor must submit a set of signed and sealed SOP document for each impacted asset.

B. Certain intersections may require vehicle detection zones in addition to Stop Bar Detection to support traffic signal operations such as Transit Signal Priority or Adaptive Signal Timing (e.g., queue detection, long-loop-occupancy detection, and multiple-point detection). This Task Group includes the engineering, construction, configuration, and testing services for full functionality and operability as necessary to provide miscellaneous detection zone types needed to support County operations.

C. This work shall include the installation of the selected vehicle detection assembly and associated supporting equipment on or within existing traffic signal infrastructure and will be shown on the signal plans. It is assumed that the TG2 signal plan is ready and is released for construction prior to this work which includes the following tasks:

1. It is assumed that new conduit will be installed at each intersection. Existing loop conduit paths that are to be de-commissioned shall be investigated to determine if the conduits are plugged, or damaged, and if they can be reused.

2. Detection cable will be installed from the traffic signal cabinet to the detection sensor location. Cables will be installed utilizing manufacturer installation guidelines.

3. Detection sensors will be installed at the locations determined on the plans developed.

4. If traffic control is required to install the detection sensors, a MOT plan will be developed according to the latest FDOT and MUTCD standards utilizing cones, warning signs and arrow boards.

5. The detection cabinet equipment will be installed in an approved location within the cabinet. Wire will be routed neatly through the cabinet and terminated on the detection panel.

6. Technology types used for stop bar vehicle detection must be capable of detecting bicycles.

7. Existing detection shall be investigated to determine if it can be reused for the purpose of this project. Proposed detection sensors must meet current Section 660 Specifications.

8. The detection zones shall be configured and tested according to approved plans.

9. Detection system operation will be tested after connecting to the new traffic controller and the ATMS central software. Detection operation must be observed in the field and from the TSS TMC to ensure proper operation. Testing must be performed following the Test Plans approved by TSS. The Test Plans must include both stand-alone testing in the field and system acceptance testing from the TSS TMC.

10. Detection system used on this Project must be listed in the FDOT APL and MDC QPL.

11. Any work required by the Contractor or Product Vendor for obtaining the FDOT APL or MDC QPL approvals is not part of this Project.

D. This work shall include the installation of pedestrian detection and associated supporting equipment on or within existing traffic signal infrastructure and will be shown on the signal plans. The Contractor must submit a list of assets which require upgrades to the pedestrian detection for TSS review and approval. All activities within this Task Group must be completed within seven (7) years from Notice to Proceed. It is assumed that the detection assembly has been made ready and is released for construction prior to this work which includes the following tasks:

1. Providing ADA compliant signal push buttons and countdown pedestrian signal heads at all signalized intersections with pedestrian crossings if applicable to the scope of the project. The location of pedestrian signal push buttons shall meet the FDOT and MUTCD criteria.

2. Only the proposed elements identified under the Scope of Work are required to meet current design/ADA criteria. However, for example, if a pedestrian push button detector is added that causes a curb ramp modification, the altered portion of the curb ramp must include new ADA compliant features.

3. The existing features within the limits of the project that do not meet design/ADA criteria do not require upgrades.

E. This work shall include the design and installation of new power infrastructure, including but not limited to the electric meter and disconnect switch elements upgrades in accordance with Section 639 (Electrical Power Assemblies) Miami-Dade County Traffic Control Equipment Standards and Specifications, the latest power service agency requirements and as required by MDC Signalization Design Manual (latest edition)

(https://signalization.miamidadeatmsproject.com/TSS-Signalization-Manual-Design-web.pdf).

F. The Contractor must submit a list of assets which require upgrades to the power infrastructure for TSS review and approval. All activities within this Task Group must be completed within seven (7) years from Notice to Proceed.

G. This Task Group requires permitting with local agencies, FDOT and Miami-Dade County. Upon start of construction and prior to County acceptance of the intersection, the Contractor shall be responsible for maintenance of the intersection and must respond to all trouble calls and provide a report documenting findings and corrective actions.

H. Existing Site Conditions (TG2): The Contractor acknowledges that all signalized intersections were built to the applicable standards at the time of their construction, but do not necessarily meet the most current standards for new signalized intersections. Further, the Contractor acknowledges that the existing equipment, not identified as damaged or failing in the pre installation site surveys, is operating in a state of good repair and is fully functioning in its intended capacity, and that all work required for installation and proper functionality of the Contractor's new equipment shall be provided at no additional charge to the County.

2.04 TASK GROUP 3: MISCELLANEOUS ENGINEERING IMPLEMENTATION (Optional Services)

If desired by TSS, the Contractor must provide these services as Optional Services on this contract as described below:

A. Provide engineering services necessary to develop, provide and integrate additional traffic signal operational features and functions that are not specified or proposed as an integral part of the Task Group 1 requirements. The Contractor's Consultant shall provide signal timing expertise and optimize system operational settings (e.g., adaptive signal, traffic responsive, Time-of-Day plan, etc.).

B. The subtasks under this Task Group include, but not limited to:
   1. Implementing engineering solutions such as adaptive signal control technology and traffic responsive control at locations approved by the TSS.
   2. Updating the preliminary Systems Engineering Documents provided, as a reference in Exhibit 12 FDOT District Six - Adaptive Signal Control Technologies (ASCT).
   3. Developing, reviewing, and optimizing existing traffic signal parameters and timing plans to be used as the baseline timing prior to implementation of TG3 engineering solutions to achieve established operational objectives.

C. Preliminary activities that must be performed to support the aforementioned subtasks include:

   1. Perform corridor analysis and identify Control Sections for TG3 engineering solutions, and/or time-of-day mode using the updated listing of traffic signal Sections provided in Task Group 1.
   2. A draft report including the description of the selection criteria and listing of recommended Sections must be provided to the County for approval at least 90 days prior to the implementation of proposed solutions.
   3. Coordinating with vehicle detection design efforts developed in Task Group 2, perform assessment of detection locations (stop bar or advanced) for TG3 engineering solutions.
   4. Configure links, detectors, threshold values and tuning parameters for TG3 engineering solutions.
   5. Prepare and submit signed and sealed report for County approval documenting TG3 engineering solutions settings, parameters, established links and proposed database changes.

D. Field verify proper functionality of implemented TG3 engineering solutions and perform on-going evaluations based on feedback from the public and County staff. "Fine-tune" and calibrate system operational settings as necessary as determined by the Contractor's Engineer of Record.

E. The Contractor must perform a before and after evaluation study for each corridor where TG3 engineering solutions are implemented to document the results and effectiveness of the TG3 engineering solutions. The before and after evaluation study must document the impacts on the main corridor, cross streets and pedestrians. The Contractor must prepare and submit the before and after evaluation study methodology to TSS for review and approval prior to performing the studies.

F. All activities pertaining to the subtasks listed above must be completed within seven (7) years from NTP.

G. Work under this Task Group shall be considered final accepted for a Section or other defined sub task when all signed and sealed documents are submitted and approved by the County and the proposed solutions are implemented, validated and accepted. The County shall provide a notification of Final Acceptance.

H. Prior to County Final Acceptance of the corridor, for TG3 engineering solutions, the Contractor must be responsible for making changes to the configuration to respond to any issues notified by the TSS. If any field related changes are needed, then the Contractor must go back to TG2 to perform the work necessary and provide a report documenting findings and corrective actions.

2.05 CONTRACTOR TEAM RESPONSIBILITIES

A. TG1, TG2 and TG3 related equipment and configuration settings shall not be considered ready for Final Acceptance of the intersection until all pertinent County staff; i.e. technicians, engineers, operators, etc. are trained. The County will provide a list of pertinent County staff prior to the trainings.

B. To ensure production viability and a smooth transition of the ATMS to the production environment and use by DTPW staff (and authorized representatives), the Contractor will commit fully qualified professional resources to all the project phases specific to the aforementioned Task Groups. The County Project Manager reserves the right to approve or reject the replacement of key personnel (project leadership) who may have responsibility with the Project.

C. Each Task Group must be managed by different and qualified personnel commensurate to the technical requirements pertaining to the Task Group. In addition, the Contractor is required to assign a single project manager to the Project who will act as the single point of contact with the County and will have full authority over all Contractor resources assigned to each Task Group. The Contractor's Project Manager will be required to maintain a regular or as-needed physical presence on the TSS Division's TMC premises as agreed upon, at the project kick-off.

D. The Contractor will provide the requested professional consultant services and produce all of the deliverables as specified in the Scope of Work and as agreed-upon in the Contract. The Contractor must perform all of the activities and tasks required to achieve all of the contract requirements, functions, outputs, and performance criteria stated therein, in a manner that meets all of the contract objectives. All services must be compliant with County, state and federal laws and regulations. All services provided by the Contractor must be appropriate and acceptable to the County Project Manager.

E. The Contractor's Project Manager will provide weekly project progress reports and conduct weekly meetings with the County Project Manager and provide a detail project plan and schedule for the upcoming (four) 4 week period. The Contractor's Project Manager shall provide an agenda at least 24 hours prior to the meeting.

F. The Contractor must submit for review and approval, copies of all documents, data, assembly and installation drawings required to convey concept, design, dimensions, maintenance, operation, and overall assembly aspects and interfaces required as a part of these design reviews. Drawings will be accompanied by material specifications, process specifications, and test data required for review and approval of the drawings, including detailed parts drawings. Drawings can include network infrastructure, network topology, and data flow for major use cases.

G. During the life of the Project, the County Project Manager will review deliverables and evaluate them for completeness, clarity, adherence to generally recognized standards, and compliance with the County's intent as conveyed in the Scope of Work and contained in the resulting contract. A deliverable, phase, or milestone will not be considered complete until formal, written approval has been given by the County's Project Manager.

H. The County reserves the right to request additional documents, or data, or any combination of documents, or data to support the review process. This additional information requested by the County must be delivered within five (5) calendar days of request. All design review meetings will be held at County offices.

I. The exact approach and methodologies of the Contractor to fulfill the deliverables and requirements of all phases as described below must be provided in the Technical Approach portion of a firm's Part I Technical and Management Proposal. The Contractor must address and discuss in detail all the required deliverables for the proposed phases in their Project Plan and organize and plan for the accomplishment of the work based on their experience with projects of similar scale and scope without hindering or impacting current traffic signal operations. The work plan must address the effective integration and re-use of existing and compatible traffic signal system components including the manner in which existing Model 2070LX controllers, currently deployed at Miami-Dade County intersections, will be integrated into the proposed ATMS system.

1. Project Initiation and Planning (must address all Task Groups)

a. After the Award Date but prior to Notice to Proceed (NTP), the Project Initiation activity builds upon the Contractor's proposed project plan. The initial Project Plan and Project Management Plans (Controller Deployment Plan and Functions Plan) are further developed, enhanced, and refined until they form a more definitive plan for completion of the Project.

b. Contractor deliverable requirements for the project initiation and planning phase activities are described in Table 1 and must separately address each of the aforementioned Task Groups.

c. The proposed project schedule must reflect document submittal dates and mutually agreed upon review and comment resolution periods.

Table 1, Project Initiation and Planning Phase Requirements

ID	Requirement	Deliverable
C-1	The Contractor must refine and deliver its proposed project plans consistent with agreements made during contract negotiation. The plan must address all requirements necessary to complete the work required by each Task Group and include: • Kick-Off Agenda • RACI Chart (Responsible, Accountable, Consulted and Informed) Matrix • Roles and Responsibilities • Work Breakdown Structure • Project Schedule • Budget • Countywide Implementation and Transition of TG1 and TG2 • Countywide Implementation and Transition of TG3 (Optional Services) • Traffic Controller Deployment Sequence Plan (to include approach to re-use of the existing 2070LX controllers) • Controller Deployment Plan • Functions Plan • Phasing of Task Groups • Quality Assurance/Quality Control • Risk Management • Risk Register • Change Management • Acceptance Management and Sign-off • Issue Management and Escalation • Communication Plan • Monitoring and Reporting • Training • Efficient scheduling of critical path activities for all Task Groups. • Closure Plan (Including Documentation, knowledge transfer and responsibilities regardless of the contracts status. The Contractor must thereafter maintain and manage the project plan.	Project Plan
C-2	The Contractor must provide and maintain a project staffing plan that identifies individual project team members assigned to each of the project Task Groups. The Contractor must thereafter maintain and manage the Project staffing plan, including efforts to meet any applicable contract goals.	Staffing Plan

2. System Configuration (Task Group 1)

a. The purpose of System Configuration is to create a technical solution that satisfies the functional requirements for the System. This activity begins with a detailed review and analysis of the functional requirements to confirm a common understanding of how to evolve the requirements into the system design. Technical specifications are created for the application developers, enabling them to build and test the system. In addition to designing the technical solution, system design is the time to initiate focused planning efforts for both the testing and data preparation activities. Test descriptions

are to be developed, traced to requirements, and include the expected test results.

b. The Contractor must develop a Traffic Controller Deployment Plan and submit prior to NTP for TSS and ITD review and approval. The Controller Deployment Plan must at a minimum include details of the areas of deployment, demarcation between the two selected controllers throughout the County, criteria for ensuring minimal to no disturbance to existing signal operations, number of controllers to be ready for deployment by week, month and annual basis. For scheduling purposes and include the consideration of the time required to execute the tasks related to database conversion, review, testing, Controller deployment and other details as requested by TSS; schedule should assume a maximum number of twenty (20) controllers a week. The Contractor must develop and provide a workflow chart as part of the Traffic Controller Deployment Plan to document roles and responsibilities of all parties including maintenance prior to TSS acceptance. The workflow chart should provide a process of handling issues and their mitigation.

c. The Contractor shall develop a Functions Deployment Plan for both the selected 2070LX traffic controller manufacturer models and submit prior to NTP for TSS and ITD review and approval. The functions deployment plan shall at a minimum include details of the team's approach for both the selected traffic controller manufacturer models respective local controller software, timeline, controller software updates, testing and other aspects.

d. The Contractor shall develop a set of blank Test Plans and Checklists (e.g., Field deployment, Controller hardware, local controller software, etc.) and submit within sixty (60) calendar days of NTP for TSS and ITD review and approval. The Contractor must document test plans defining the overall strategy for validating the functionality of the system, the approach to ensure test coverage of each requirement, the individual test cases that will be performed to execute the testing strategy, the environments in which the tests will be conducted. The test plans at a minimum must include, but not limited to testing objectives, scope of testing, responsibilities of who will be performing the test, tools, and equipment to be used for testing, overall testing approach, testing sequence, and defect criteria and reporting. The Contractor shall develop and use checklists to ensure all tasks are complete prior to delivery of any activity. The checklists must be submitted to TSS to prove that quality assurance and quality control activities are performed prior to delivery of any activity/document/software.

e. The Contractor shall develop the Local Controller Software documentation for both the selected 2070LX traffic controller manufacturer models and submit within sixty (60) calendar days of NTP for TSS and ITD review and approval. The software documentation shall include all the user manuals, detailed specifications, database documentation and other documents required for operating and maintaining the system. The software documentation shall include a step-by-step configuration of how to add new data, how to edit/modify/update existing data and other industry standard information. In addition, the software documentation shall include user manuals and other documents required for operating and maintaining the system. The software documentation shall also include a step-by-step configuration of how to program the controller for each of the functions that can be replicated later by TSS. The Contractor shall submit the local controller software documentation to TSS for review and approval along with each software release in addition to the upfront documents/manuals/plans.

f. Change Management Form

For all software deployments, the Contractor shall provide a System Change related documentation that includes the following key attributes:

- Description of Change
- Service Impact
- Implementation Plan/Action Plan
- Rollback/Contingency Plan
- Close-out Comments

The Contractor shall complete the MDC ITD's Change Management Form (FM-PR-IT-023) to document

and request support for system upgrades or changes. This form will be routed via ITD change management process. The Contractor must coordinate with Miami-Dade County Information Technology Department (ITD) and obtain all required ITD procedures to be followed for the Project.

g. ATMS Central Software Documentation (Optional Services)

- The Contractor must develop the ATMS Central Software Architecture document and submit within thirty (30) calendar days of NTP for TSS and ITD review and approval. The ATMS central software architecture must show and describe all the major modules/functionalities within the software and their relationship to each other and with other existing systems. The system architecture design document must describe the overall system architecture in terms of network, redundancy, system performance, security, hardware, software, tools, peripherals, software licenses, system architecture diagrams, data flows documents, database design document with entity relationship diagrams, data dictionary, and the logical distribution of system components and processes across the architecture. Additionally, the document must detail the system's failover mechanisms and disaster recovery plans to ensure continuous operation and data integrity in the event of a system failure or other unforeseen incidents. The disaster recovery plans must include descriptions of backup processes, data replication strategies, and any hardware or software redundancy solutions. The architecture must address scalability to accommodate future growth and technological advancements. If the Contractor has to make changes to the proposed design, a new updated software architecture must be developed providing justification and submitted to TSS for review and approval. This new software architecture must include any and all changes to the system that was previously approved by TSS.
- The Contractor shall develop an ATMS Central Software Deployment Plan and submit within thirty (30) calendar days of NTP for TSS and ITD review and approval. The deployment plan must document the Contractor approach for deployment of the ATMS central software, number of planned number of versions along with key features per each version, documentation submittals, licensing, pre-production, testing, production deployment, operations, and maintenance for the duration of the Project. The deployment plan must include Contractor's approach to meet all MDC ITD requirements. The deployment plan must provide a roadmap for future software upgrades and licensing.
- The Contractor shall develop the ATMS Central Software documentation and submit within sixty (60) calendar days of NTP for TSS and ITD review and approval. The software documentation must include all the user manuals, detailed specifications, database documentation, and other documents required for operating and maintaining the system. The software documentation must include a step-by-step configuration of how to add new data, how to edit/modify/update existing data, how to create reports, how to create and manage alerts, how to set-up user account credentials, system performance, and other industry standard information. The Contractor shall submit the ATMS central software documentation to TSS for review and approval along with each software release in addition to the upfront documents/manuals/plans. The Contractor must develop and provide training materials, integration guide and other documents that detail all steps by users to access the ATMS central software and be able to integrate the new and existing 2070LX traffic controllers in the future

h. Contractor deliverable requirements for the system design activities are described in the below tables

Documentation Deliverable	**Due Date**
Traffic Controller Deployment Plan	Prior to NTP
Functions Deployment Plan	Prior to NTP

SCOPE OF WORK

Documentation Deliverable	Due Date
Blank Test Plans and Checklists	Sixty (60) calendar days of NTP
Local Controller Software Documentation	Sixty (60) calendar days of NTP and along with each software release
Change Management Form	For all Software Deployments

Table 2, System Configuration Phase Requirements

ID	Requirement	Deliverable
C-3	The Contractor must develop and deliver a system architecture design document that describes the overall system architecture in terms of network, redundancy, system performance, security, system, hardware, software, tools, peripherals, software licenses, and the logical distribution of system components and processes across the architecture. (Optional Services)	System Architecture Design
C-4	During System Configuration, the Contractor must deliver system security design documentation describing the logical security architecture design, the physical security architecture design, and the design of all controls to be used to mitigate threats to the confidentiality, integrity and availability of the system and system data.	System Security Design
C-5	The Contractor must identify and document the database schemas, file formats, data views, an entity relationship diagram, and data dictionary for the system (if applicable, for the traffic controller software) (Optional Services for ATMS central software).	Database Documentation
C-6	The Contractor must provide a programmer's manual for any language-independent application programming interface (API) (if applicable, for the traffic controller software) (Optional Services for ATMS central software).	Programmer's Manual for API
C-7	The technical documentation must include: • detailed specifications for hardware and software components • system performance expectations • data conversion approach	Technical Documentation
C-8	The Contractor must document test plans defining: • the overall strategy for validating the functionality of the system • the approach to ensure test coverage of each requirement • the individual test cases that will be performed to execute the testing strategy • the environments in which the tests will be conducted The test plans must include: • testing objectives • scope of testing (both what is in and what is out of scope) • responsibilities (who will be performing the test) • testing approach • testing sequence • defect reporting and criteria	Test Plans

C-9	The test case descriptions must be traced to requirements and include: • test data needed to execute the tests • preconditions required prior to the start of test • criteria for suspending and resuming testing • expected test results	Test Case Descriptions

3. Network, Server, and Communications (Task Group 1) (Optional Services)

a. The Contractor must submit as part of the design review an Infrastructure design document. The infrastructure design provided by the Contractor must be approved by MDC and must be a solution that provides 24/7 high availability, fault-tolerance, security and ease of management. No single point of failures can exist. The failure of any single component, whether hardware or software, will not impact the system as a whole. The Contractor must facilitate separate Production, Development and Disaster Recovery environments for this solution. Reporting should also be designed in such a manner where a user running reports should not affect Mission-Critical functions.

b. The County operates a private-cloud infrastructure where Server resources are provisioned as required. Outside a cloud facilitated environment Contractor's design must use the County-facilitated infrastructure at the Regional Data Processing & Communications Center (RDPCC)

c. With any design a clear division of Application, Database and Reporting functions must be present so that each component can fit into each individual environment. The Contractor must manage permissions by Lightweight Directory Access Protocol (LDAP) Integration with Active Directory (AD) with the County's Federation Services.

d. Solution must separate Production, Development and Disaster Recovery environments. Reporting should also be designed in such a manner where a user running reports should not affect Mission-Critical functions. The Contractor shall prepare this information based on FDOT and MDC ITD's disaster recovery plans and systems.

e. The Contractor must clearly supply a list of all Servers required, along with detailed specifications on the resources needed to accommodate the entire scope of the project (with the final expected capacity of users and nodes). Miami-Dade County recommends that application design be scaled horizontally, allowing for additional application components to be provided on additional servers as opposed to just adding more power (CPU, RAM) to a single machine. Please note, once maximum Virtual Machine specifications for a single Virtual Machine are reached (see previous paragraph) they cannot be further increased. The Contractor shall also identify nominal and recommended system requirements for Workstations and network to insure proper functionality.

f. Access to the application should be designed in such a manner where an upgrade or change to the application does not require staff to go computer to computer to manually update software. If an application installation is needed on an individual workstation, that software should be self-managed and be able to be updated on-demand without interaction from MDC IT staff. MDC also operates an extensive Citrix XenDesktop and Xenapp environment (version 7.15 LTSR) which can be leveraged to provide a consistent client environment to users. In addition, if web servers are used, they must able to support the most current versions of Internet Explorer and/or Google Chrome as they are upgraded. All updates shall be automatic.

g. All Servers and installed software must comply with MDC Security Standards. MDC accepts, processes, stores and transmits Credit Card data for numerous applications thus must comply with the criteria within the Payment Card Industry Data Security Standard. The PCI-DSS provides for an open security testing and scanning baseline with tools available from numerous vendors. All ATMS related systems and applications must be secure at all times. Servers must be joined to our domain and have our Enterprise Anti-Virus client installed. Monthly Microsoft Patching will be applied within same month of release. All installed software (including the application, third-party software and

development environments e.g. .NET and/or JAVA) must be patched and up to date. The Miami-Dade County's IT Department will also subject all ATMS related systems to regular Security scanning with our Qualys security system which scans against known Common Vulnerability and Exposures (CVEs). At no point should any sensitive data, including logon credentials, be stored or transmitted unencrypted. The solution must utilize Single Sign-On (SSO) technology to eliminate the need for storing or transmitting sensitive user credentials or other confidential information. Authentication processes should be handled centrally, ensuring that sensitive data such as passwords or authentication tokens are not stored locally or transmitted between systems. This approach enhances security by reducing the risk of unauthorized access or data breaches associated with storing or transmitting sensitive information.

h. All work that may affect telecommunications must be coordinated and prior approval received for such work from Miami-Dade County IT Department (ITD).

i. The Contractor shall escalate any communication/hardware issues outside its control immediately to the County.

4. Data Conversion and Migration (Task Group 1) (Optional Services)

a. The database conversion must be performed by qualified professionals, and new timing documents submitted must be signed and sealed by a Professional Engineer licensed and registered in the State of Florida.

b. The Contractor must provide the data necessary to populate the ATMS must be entered into the system, e.g. field equipment characteristics, sign and camera locations, etc.

c. The deliverable requirements for the data migration activities are described in Table 3.

Table 3, Data Conversion and Migration Requirements (Optional Services)

ID	Requirement	Deliverable
C-10	The Contractor's Consultant must convert existing signal timing databases to the format specific for the new local controller software. The converted databases must ensure proper clearance intervals and safe signal operations. Substandard clearance intervals must be recalculated and adjusted by the Contractor's Consultant. Any other signal timing parameters impacted by clearance interval modifications must be evaluated and adjusted by the Contractor's Consultant. Additionally, the databases must maintain the same signal operational functions as the existing signal controllers.	Signal timing database
C-11	The Contractor's Consultant must provide updated intersection signal timing documentation for each intersection which must be signed and sealed by a Florida registered professional engineer.	Updated Signal Timing Documentation
C-12	The Contractor's Consultant must provide data entry of all data necessary to populate the ATMS on the Pre-Production and Production Environments.	Approved entry of system data

5. System Construction (Task Group 1)

a. The System Construction phase consists of all activities required to build, test, and validate the new System to the point at which it can be turned over for System Acceptance. This includes construction of all components of the system, including utilities required to adequately prepare and load the data. In addition, System Construction consists of a series of tests of the system components, with each set of tests are to be performed against a progressively larger grouping of components until the operation of the system, in its entirety, has been verified. All actual test results must be documented, and necessary corrective actions must be implemented in the system and system documentation. Status reports of testing progress must be provided on a regular basis and must include the status of corrective actions.

b. The County typically deploys applications into a pre-production environment initially to ensure the applications are completely functional and defect-free before transitioning the deployment to the production environment, which is reflected in the requirements below. (Optional Services)

c. Since the ultimate goal of this activity is to produce a System that is ready for acceptance testing, an aspect of this phase must be the creation of the various training materials and system documentation that support the new system, including preparation of technical support materials. These materials need to address both the use and maintenance of the system and must play an integral part in the System Acceptance and System Implementation phases of the lifecycle.

d. Deliverable requirements for the System Construction activities are described in Table 4.

SCOPE OF WORK

Table 4, System Construction Phase Requirements

ID	Requirement	Deliverable
C-13	During System Construction, the Contractor must deliver test results including detailed outcomes for the following: • data migration tests (optional services) • system tests (including performance tests) • security tests (if applicable)	Test Results
C-14	During System Construction, the Contractor must deliver test results that identify the version of each software component tested.	Test Results
C-15	During System Construction, the Contractor must deliver test progress reports that include: • number of defects identified in testing • types of defects found • status of corrective actions	Test Progress Reports
C-16	During System Construction, the Contractor must deliver a validated system in the Pre-Production environment, to include the installation and integration of all ATMS components. (Optional Services)	Validated Pre-Production System
C-17	During System Construction, the Contractor must update and deliver technical documentation to include corrective actions implemented as a result of testing activities.	Updated Technical Documentation
C-18	During System Construction, the Contractor must develop and deliver the following user documentation: • User Manual • Database Administrator Manual, including installation and upgrade guides (Optional Services) • Troubleshooting Procedures and Maintenance Manual • System Administrator Manual • FAQs and scripts for technical support staff • Documentation on how to incorporate customizations during system upgrades	User Documentation
C-19	During System Construction, the user manuals must include a collection of printable on-line documentation designed to instruct users in the operation of the System.	User Documentation

6. System Acceptance (Task Group 1)

a. System Acceptance is the point in the lifecycle at which every aspect of the application along with any supporting data conversion routines and system utilities, are thoroughly validated by the County (or its representatives) prior to proceeding with System Implementation. This entire phase is centered on gaining sufficient evidence of the system's accuracy and functionality to be able to proceed to System Implementation, in accordance with the Acceptance Test Procedure Document (hereinafter referred to as "ATP"). In addition to confirming the operation of the system, in accordance with the Contract Documents, System Acceptance is also the point in the lifecycle during which all supporting documentation and reference materials are refined and updated to guarantee their consistency with the final delivered system.

b. The County will review the ATP to ensure appropriate procedures have been designed to rigorously test the system software, hardware and integration. To assist the County in this review, the

acceptance test plan must include a compliance matrix that confirms the tests evaluate all functional requirements. Upon written approval from the County, the Contractor can begin acceptance testing.

c. Contractor deliverable requirements for the System Acceptance activities are described in Table 5.

Table 5, System Acceptance Phase Requirements

ID	Requirement	Deliverable
C-20	The Contractor must prepare a comprehensive acceptance test plan for review and approval by the County. The plan must serve as a guide to operationally test system hardware, software and integration. The plan must include a detailed description of the tests to be conducted and the purpose of each test. Each test should be mapped to at least one of the functional requirements. Test procedures, including specific steps and the sequence of steps to be followed, must be specified.	Test plan
C-21	The acceptance test plan must include evaluation criteria for each test based on the functional requirements matrix. The criteria set forth by the plan will be used as the standard by which the County will judge the success or failure of each test.	Test plan
C-22	A testing schedule must be included in the acceptance test plan. This schedule must demonstrate the order in which tests are to be performed as well as the expected duration of each test. Allocate reasonable durations for the County validation of test results.	Test schedule
C-23	During System Acceptance, the Contractor must deliver final test results for the following: • data validation results • data migration (optional services) • acceptance test results (including performance tests) • security and vulnerability test results (if applicable)	Test Results
C-24	During System Acceptance, the Contractor must deliver an accepted operational System.	Accepted System
C-25	During System Acceptance, the Contractor must deliver an accepted and migrated data in the system. (Optional Services)	Migrated Data

7. System Implementation (Task Group 1)

The purpose of System Implementation can be summarized as the deployment and the transition of system support responsibilities. At a finer level of detail, deploying the system consists of executing all steps necessary to educate the system users on the use of the new system, placing the newly developed system into production, confirming that all data required at the start of operations is available and accurate, and validating that business functions that interact with the system are functioning properly. Transitioning the system support responsibilities involves changing from a “system development” to a “system support and maintenance” mode of operation, with ownership of the new system moving from the Contractor to the County. Deliverable requirements for the Implementation Activities are described in Table 6.

Table 6, System Implementation Phase Requirements

ID	Requirement	Deliverable
C-26	The Contractor must deliver an operational, accurate and formally accepted System to the County. This includes, but is not limited to: populating intersection data, creating Time Space Diagrams, categorizing	Operational System

SCOPE OF WORK

ID	Requirement	Deliverable
	intersections created, etc. (Optional Services)	
C-27	The Contractor must deliver approved installation scripts/tools to the County. The Contractor must deliver approved data migration scripts/tools to the County (Optional Services)	Installation Scripts/Tools Migration Scripts/Tools
C-28	The Contractor must install and deploy the system in accordance with the approved Project Implementation and Transition Plan.	Operational System
C-29	The Contractor must conduct knowledge transfer in accordance with the approved training requirements.	Knowledge Transfer

8. Training Requirements

a. The ATMS will be a mission critical complex system that will be used daily by many County staff and its authorized representatives. The County considers the training of these users to be critical for acceptance of this system as well as the daily use of this system. The County will review and approve all Contractor's training staff and user training materials, including training plans and role-based training materials. The County will identify all County and authorized representative staff to be trained by role.

b. Training material shall be comprehensive and provide a step-by-step guide on how to use and program all the features and functionalities based on user roles and access levels.

c. The Contractor is encouraged to recommend the environment to be used for training, pre-production or production, as they provide their detailed description of training in their Technical Approach. The instructor or instructors provided by the Contractor must be proficient in the use of the controller hardware and local controller software, and must have previous formal classroom instructor training. Instructors must demonstrate a thorough knowledge of the material covered in the training and familiarity with the training manuals.

d. Training must also include features provided in Task Groups 2 and 3.

e. The County requires eight (8) formal classroom training sessions to be conducted at a county facility. Contractor shall adequately plan for the attendance of at a minimum of fifteen (15) County personnel at each session, with the required training material. The number of attendees may vary, and the Contractor shall be responsible for adjusting to the number of attendees.

f. If prerecorded lectures or other video presentations are part of the training, the instructor or a qualified substitute must also supplement recorded material in person. The County reserves the right to review and approve all instructors. Should an instructor prove unsatisfactory to the County, the Contractor must provide an acceptable replacement within three (3) days.

g. The County reserves the right to copy all training manuals and aids for use in future's training sessions.

h. Additional Contractor training requirements are described in Table 7.

Table 7, Training Requirements

ID	Requirement	Deliverable
C-30	The Contractor must prepare a training plan for the traffic controller hardware and software.	Training Plan
C-31	Training must be conducted at the County's TMC, traffic signal shop, and field locations as appropriate.	Training Plan
C-32	The Contractor must provide qualified instructors for the training.	Training Program
C-33	Upon completion of the training, all training materials will become the property of the County. The Contractor must provide the County with all changes and revisions to the training manuals and other training documentation. Training materials shall be tailored to the operational role of the trainee (i.e., operator, area engineer). System and controller manuals shall be used as supporting documentation for training not as the training materials.	Training Materials
C-34	The Contractor must provide assistance to the County to implement an ATMS training environment in the Pre-Production Environment. (Optional Services)	Training Environment
C-35	The Contractor must provide the capability to refresh the ATMS training environment for each training session. (Optional Services)	Training Environment
C-36	The Contractor must deliver sufficient multiple sessions to accommodate the number of users identified by the County and to allow for the fact that TMC coverage needs to be maintained during the trainings.	Training Program
C-37	The Contractor must refine and deliver a Training Plan identifying the: • Schedule for all role-based training sessions • Contractor-provided resources to deliver training • Training evaluation collection, analysis, and improvement process • Success metrics identification, collection, and evaluation process • Expected training results • Post Training Support	Training Plan
C-38	The Contractor must develop customized Systems role-based training and materials for each role. Role based training materials may include: • Participant Guidebooks (Printed and Electronic) including exercises • Instructor Guidebooks (Printed and Electronic) including exercises and answers • CD's containing the Participant Guidebooks in MS Word and PDF format • CD's containing the Instructor Guidebooks in MS Word and PDF format • PowerPoint Presentations • User Manuals • On-Line Help	Training Materials
C-39	The Contractor must update impacted training material whenever software changes, including customizations, affect the operation of the software.	Training Material Updates

i. All training sessions must be video recorded and provided to TSS and ITD for future use. The Contractor

shall provide audio and video visual training sessions developed per each topic and bookmarked for ease of reference. All video recording sessions must be stored on the project IT equipment or on the internet or on the cloud which allows easy access to TSS and ITD staff, including Project CEI, FDOT, local cities, and other consultants. The location of training material storage must be approved by TSS along with the security access logins. The training sessions must include step-by-step processes of various activities using examples from the MDC traffic signal system operations.

j. Key aspects of the Training to be included, but not limited to, are:

1) Software Overview

- Provide a general overview of the software.
- Discuss the various features, functionalities, reports, data input sources, data analysis techniques used and data output.
- If expected features are under development at time of training. Instructor should identify and train the staff with a work around for these features.

2) Reports & Alerts: At a minimum, provide the below information:

- Provide details on default reports and alerts.
- Provide details on how to: access, read, interpret and customize information.

3) Signal System Updates: At a minimum, provide the below information:

- Provide with live examples on what performance measures to check.
- Provide details on how to modify detector configuration as new detection infrastructure is added.
- Discuss with examples on ways to incorporate Hi-Resolution Data within the current operational Procedures.
- Conduct a hands-on workshop with operational use cases.
- Provide checklists based on best practices.

4) Controller software troubleshooting

- Provide examples of what issues could arise during normal operation of the local software.
- Conduct a hands-on workshop with operational use cases.
- Provide checklists based on best practices.

5) IT Information

- Local controller software configuration and privileges.
- Local controller software storage overview.
- Local controller software communications and network troubleshooting.

9. System Support Requirements (Task Group 1)

a. The Contractor will provide two full-time controller expert staff in the County's TMC during the term of the contract, commencing with the start of the project, to support the County in transitioning the controllers, detections and communications from the existing system to the new one. The proposed staff qualifications are stated in Section 2.02 E.1 of this document.

b. The staff will require attendance at periodic status meetings where the scope of the support will be determined. The on-going support will include but not be limited to:

- Review local controller software bug reports, enhancements, and upgrades.
- Review any custom software bug reports and enhancement requests.
- Document potential issues and identify root causes.
- Resolve issues and track to completion.
- Provide local controller and local controller software expertise to help operate, troubleshoot, maintain and train TSS staff
- In addition to the onsite Controller Expert staff, the Contractor must provide the System Support Requirements are described in Table 8.

Table 8, System Support Requirements

ID	Requirement	Deliverable
C-40	The Contractor must follow the Contract Agreement that will cover the System from the final acceptance of the System. The operational support covers the following: • Remote diagnostics • Technical support from the Contractor • On-site issue resolution if necessary • Fixes to the software (updates, upgrades, security patches, etc.) • Updates to user, technical, and training documentation to support software changes resulting from fixes	Maintenance Agreement
C-41	The Contractor must provide technical and system support for end-users 24 x 7 x 365.	Technical Support
C-42	The Contractor must comply with the Service Level Objectives provided in Table 9 below.	Technical Support
C-43	The Contractor must: • Propose a backup and recovery process which meets County's requirements • Recommend disaster recovery (DR) processes (Optional Services) • Provide instructions for business continuity (BC)	Backup & BC/DR Processes
C-44	The Contractor must provide County personnel with access to an enhancement-tracking system.	Enhancement Tracking System Access
C-45	The Contractor must provide County personnel with access to a System bug-reporting and defect-resolution system.	Defect Tracking System Access
C-46	The Contractor must attend on-going support status meetings with County personnel, as needed.	Technical Support
C-47	The Contractor must periodically (at least once per year) provide the County with the software release schedule for any System off-the-shelf software components.	Software Release Schedule

c. Support Service Level Objectives:

Table 9, Defect Service Levels Objectives

Defect Priority	Response Time	Resolution Time	Hours and Days of Coverage
Priority 1	1 hour	4 hours	24 hours per day; 7 days per week
Priority 2	4 hours	1 business day	8:00 a.m. to 8:00 p.m. ET weekdays
Priority 3	1 business day	2 business days	8:00 a.m. to 6:00 p.m. ET weekdays

1) Response Time is defined as the time between the receipt of the call and the time that a Support Team member begins working on the problem.

2) Resolution Time is defined as the time between when the Support Team member begins working on the problem and the time the problem was resolved.

3) A Priority 1 Defect is a problem whose nature and/or severity prevent the County from continuing its business. A Priority 1 Defect may have one or more of the following characteristics: (a) a critical function of the Application/Device is not available; (b) the Application/Device hangs indefinitely and/or causes other County applications to hang; (c) the Application/Device crashes and/or causes other County applications to crash; and/or (d) a security incident has occurred or is suspected to have occurred.

4) A Priority 2 Defect may have one or more of the following characteristics: (a) the performance, functionality or usability of one or more of the Application/Device's parts is severely degraded; (b) multiple users are impacted; and/or (c) one or more business functions are unavailable or unusable by the end users.

5) A Priority 3 Defect is a failure of a system or part thereof which has a minor impact on a County business process and can be handled on a non-immediate basis. Examples may include user requests (e.g., a report is not formatted correctly) and peripheral problems (e.g., output fails to print properly).

6) Contractor must not close a Defect unless a Fix has been demonstrated to either: (a) repair the functionality, performance and usability of the Application/Device to its pre-Defect level or (b) improve the functionality, performance and usability of the Application/Device from its pre-Defect capability.

7) Unless, for a particular defect, the County has provided prior written approval for different response times, the Contractor must, for each calendar month and for each Defect Priority level, respond to one hundred percent (100%) of reported Defects within the Maximum Response Time during Hours and Days of Coverage.

8) The Contractor must submit in writing to the County Project Manager a description of the failure and resolution within two (2) days of resolution.

9) The Contractor shall coordinate with ITD for issues related to IT that require elevated privileges, access, or ITD assistance. Implementing separate Defect Service Level Objectives (SLO) for such issues is necessary based on the ITD input.

10. Engineering Documentation

    a. The Contractor's Consultant shall provide the County with complete installation documentation of the traffic signal control system to include:

        1) As-built signal plans at each intersection for vehicle detection installation if applicable, as well as the additional conduit and pull boxes if necessary. These as-built signal plans must be signed and sealed by a Florida registered professional engineer prior to delivering to the County.

        2) On the design plans, the Contractor must provide updated traffic signal SOP document for each intersection, if needed based on the proposed signal design updates. The SOP document must be signed and sealed by a Florida registered professional engineer prior to delivering to the County.

        3) System analysis documents of each corridor to assess the appropriate deployment of adaptive signal technology. (Optional Services)

        4) Proposed detection placement assessment documents for TG3 engineering solutions

deployment. (Optional Services)

Table 10, Engineering Documentation Requirements

ID	Requirement	Deliverable
C-48	The Contractor's Consultant must submit the 90% plans, signed and sealed final plans, and sign and sealed as built plans. Also, include a sign and sealed detection channel form per intersection. These documents must be signed and sealed by a Florida PE.	Signed and sealed as-built signal plans
C-49	On the design plans, the Contractor's Consultant must provide updated signal SOP document and timing sheets (e.g., controller timing reference table) for each intersection if there are any traffic signal operational changes as required by the current MDC design guidelines. These documents must be signed and sealed by a Florida PE.	Signed and sealed SOP documents
C-50	The Contractor must submit field deployment checklist(s) for each intersection.	Controller Deployment documents
C-51	The Contractor's Consultant must provide technical documents of detection placement, as defined in Task Group 2, for implementation Task Group 3 solutions. These documents must be signed and sealed by a Florida PE.	Detection placement assessment document
C-52	The Contractor's Consultant must provide an updated listing of traffic signal Sections as described in Task Group 1 (Section 2.02 B). A draft report including the description of grouping criteria and the updated Section listing must be provided to the County within 90 days after Notice to Proceed. These documents must be signed and sealed by a Florida PE. (Optional Service)	Signed and sealed Report
C-53	The Contractor's Consultant must provide a report as described in Task Group 3 (Section 2.04 C1) to the County for approval at least 90 days prior to the implementation of proposed solutions. These documents must be signed and sealed by a Florida PE. (Optional Service)	Signed and sealed report
C-54	Prepare and submit signed and sealed report for County approval documenting adaptive control and traffic responsive settings, parameters, established links and proposed database changes. (Optional Service)	Signed and sealed report

11. Contractor Performance Requirements

a. The County will assign a County Project Manager or Authorized Representative to lead and coordinate the effort for the County. All deliverables, status reports, meetings, and project-related communications will go through the County's Project Manager for proper coordination and distribution unless otherwise directed by the County's Project Manager.

b. Table 11 provides a description of Contractor performance requirements for interaction with the County's project team.

Table 11, Contractor Performance Requirements

ID	Requirement
C-55	The Contractor must request for and obtain approval from the County prior to appointing or replacing key personnel.
C-56	Should it become necessary to replace key personnel, the Contractor must provide replacement staff members for key personnel with equal or superior skills and qualifications, with full authority to act in that position for full performance under the Contract, and with rates not to exceed those of the originally supplied staff member.
C-57	The Contractor's project manager must serve as focal point of contact for the County regarding project status, meetings & reporting requirements.
C-58	The Contractor's project manager is responsible for managing scope changes, and financial, administrative, and technical issues or concerns raised by the County.
C-59	The Contractor must work in cooperation with the County and its designated authorized representatives to ensure proper coordination of the Project with other County initiatives.

2.06 TEAM EXPERIENCE AND QUALIFICATIONS

A. Contractor Experience and Qualifications (must address each Task Group)

The County considers Contractor's qualifications and experience to be of paramount importance. Contractor must document their experience as described in Response Requirements and Proposal Format.

The Contractor's team experience must be relevant and must be for services comparable, in scale and scope, to the County's Traffic Signal System's operation.

The Experience and Qualification requirements are described in in Table 12.

Table 12, Contractor Experience and Qualification Requirements

ID	Requirement
C-60	The Contractor's Consultant must have a minimum of five years of traffic signal engineering experience providing ATMS, Systems Integration, and implementation services using the proposed solution. The demonstrated experience must be commensurate to the scale and scope of the Project.
C-61	The Contractor's Consultant's experience must be readily verifiable.

ID	Requirement
C-62	The Contractor's Consultant must be qualified by the Florida Department of Transportation in the following Rule 14-75, Florida Administrative Code Consultant Work Type Categories: 6.1 Traffic Engineering Studies 6.2 Traffic Signal Timing 6.3.1 Intelligent Transportation Systems Analysis and Design 6.3.2 Intelligent Transportation Systems Implementation 6.3.3 Intelligent Transportation Systems Communications 6.3.4 Intelligent Transportation Systems Software Development 7.3 Signalization
C-63	The Contractor's Consultant must be technically certified in the following main work class category and work class designations: 3.04 Traffic Engineering Studies 3.07 Traffic Signal Timing 3.08 Intelligent Transportation Systems Analysis, Design, and Implementation 3.11 Signalization 16.00 General Civil Engineering 17.00 Engineering Construction Management The Contractor's Consultant (or qualified subconsultants) must be technically certified in the following main work class category and work class designations: 11.00 General Structural Engineering 13.00 General Electrical Engineering 15.01 Land Surveying 19.03 Highway Systems
C-64	The Contractor's traffic signal contractor must meet the licensing and qualification requirements stipulated in Article 1.05 of Section 600 of the Miami-Dade County Traffic Control Equipment Standards and Specifications (General Provisions for Traffic Control Devices).

SCOPE OF WORK

ID	Requirement
C-65	At all times, the Contractor's traffic signal contractor must demonstrate that it has full-time personnel with the necessary experience to perform the Project's Scope of Work. This experience shall include work in successfully completed projects performed by the identified personnel whose bulk of work performed in the Public Right-of-Way is similar in detail of the construction work described in the Scope of Work. Pursuant to Section 255.20, F.S., the County may consider a proposed signal contractor in good standing, meeting the license requirements above, that has been prequalified and considered eligible by the Florida Department of Transportation (FDOT) under Section 337.14, F.S. and Chapter 14-22, Florida Administrative Code, to perform the traffic signal installation work described. Contractors seeking consideration of their traffic signal contractor under this sub-paragraph shall submit along with the Proposal Documents for review and consideration, current copy(s) of the proposed traffic signal contractor's FDOT Certificate(s) of Qualification in the Traffic Signal and Electrical Work Classes, Certification of Work Underway, and Status of Contract(s) On Hand.

B. Contractor Key Personnel

1. The Contractor must provide and maintain for the contract term, necessary staff to conduct the Project defined in the Scope of Work, to perform all of the required tasks, and produce all required deliverables.

2. The County requires that the Contractor maintain at all times, the following key staff roles (positions) and any other roles that it considers instrumental to the Project:

a. Project Manager – Responsible for execution and coordination of all aspects of the Contractor's Project Plan and schedule; provides the primary point of contact for the County, also has authority to act on behalf of the Contractor.

b. Task Group Manager - Responsible for execution and coordination of all aspects of the Contractor's project plan and schedule pertaining to the work under a specific Task Group.

c. Technical Architect – Responsible for the design and implementation of the proposed technical solution.

d. Software Engineer – Responsible for leading the software development activities for the implementation of the proposed system including creation of application specifications, design and development for any custom software, configuration and implementation of any commercial-off-the shelf (COTS) software, and system testing activities.

3. Substitutions for such key personnel cannot be made without County approval. Should it become necessary to replace the key personnel, the Contractor must provide replacement staff with equal or superior skills and qualifications.

4. During the course of the Contract, the County reserves the right to approve all replacement prime consultant personnel; the County also reserves the right to approve any replacement subconsultant personnel after proposal submission and after contract execution.

5. Table 13 specifies the requirements for key personnel, post contract award.

SCOPE OF WORK

Table 13, Contractor Key Personnel Requirements

ID	Requirement
C-66	The Contractor must retain key personnel to be responsible for coordinating with the County and managing project activities. Key personnel include: • Project Manager • Task Group Manager • Technical Architect • Software Engineer
C-67	The Contractor's Project Manager must have a minimum of 10 years of verifiable experience overseeing ATMS projects and be a professional engineer licensed in the State of Florida and be readily available at the Traffic Signals and Signs Facility. In the event of a substitution, replacement staff with equal or superior skills and qualifications must be submitted to County for review and approval.
C-68	The Task Group manager must have a minimum of 7 years of verifiable experience designing and implementing solutions required under the assigned Task Group and be a professional engineer licensed in the State of Florida. In the event of a substitution, replacement staff with equal or superior skills and qualifications must be submitted to County for review and approval.
C-69	The Technical Architect must have a minimum of 5 years of experience designing and implementing ATMS solutions. In the event of a substitution, replacement staff with equal or superior skills and qualifications must be submitted to County for review and approval.
C-70	The Lead System/Software Engineer must have a minimum of 5 years of verifiable experience leading system/software activities for the implementation of ATMS systems and be a Professional Engineer licensed in the State of Florida. In the event of a substitution, replacement staff with equal or superior skills and qualifications must be submitted to County for review and approval.

2.07 ENGINEERING DESIGN AND CONSTRUCTION REQUIREMENTS

A. The following requirements are in addition to the requirements stipulated in the Contract Documents including DTPW Division 01 Construction Specification (Exhibit 1), Traffic Control Equipment Standards and Specifications Section 600 (Exhibit 2), and the Traffic Control Equipment Standards and Specifications.

B. Design Criteria

1. The design shall be prepared in accordance with all applicable codes, manuals and guidelines, and as per the construction milestones provided in the Agreement and this document. Plan shall be accurate, legible, and complete in design, and furnished in reproduction form, size, and material acceptable to the County.

2. The Contractor's Consultant shall have Florida Licensed Professional Engineers sign and seal all plans, specifications, calculations, and reports, and shall perform all professional requirements of the engineer of record (EOR).

3. Before construction activities can begin for a specific component, signed and sealed design documents and calculations supporting the design for that component must be submitted to Miami-Dade County TSS Division for review and approval. Upon review by Miami-Dade County TSS Division, the design documents will be stamped "Release for Construction" and returned to the Contractor. The release for construction does NOT relieve the Contractor of any liability or responsibility for errors or omissions in the design documents.

4. The Contractor's Consultant must prepare the final As-Built plans/record document. The Contractor's Consultant must have a Florida Licensed Professional Engineer (EOR) sign and seal the Final As-Built plans.

5. All design and construction documents must be prepared using the U.S. customary system of units (feet, pounds).

C. Engineering and Design

1. All plans shall be 100% electronically generated using AutoCAD software Windows version 2018 or later. Existing signal plans provided by Miami-Dade County TSS Division may be utilized as the base file for vehicle detection design in signal plans. Signal plans provided by TSS must be verified in the field as plans may be outdated.

2. The Contractor must prepare the new traffic signal control database for each 2070LX controller to replicate the existing traffic signal operations provided by the existing controller at the same intersection. The Contractor shall load the new database into the new 2070LX controllers and perform bench testing prior to field installation. (Optional Service)

3. The Contractor must not construct or install any work without the review and release notice from Miami-Dade County TSS Division and approval from permitting agencies including Miami-Dade County.

4. Any changes that may result from the Contractor constructing, installing or submitting of design to permitting agencies without a release notice from Miami-Dade County TSS Division must be performed at the Contractor own risk and at no additional cost to Miami-Dade County TSS Division and must not delay the Work. Miami-Dade County TSS Division reserves the right at its sole discretion to stop the work.

D. Engineering and Design for Vehicle Detection

1. The Contractor's Consultant must prepare a complete sign and sealed design of the vehicle detection system at each semi-actuated signalized intersection to provide actuated traffic signal operation and must obtain written approval by Miami-Dade County TSS Division before the installation of vehicle detection is started. The Contractor shall be responsible for coordinating the design package with all permitting agencies, as applicable.

2. To support the overall goals and objectives of the project, the Contractor's Consultant will provide the following engineering & design services:

   a. Prepare design documentation sufficient to allow for the efficient installation of the vehicle detection devices. The work will include development of base plans as possible, field surveys, and design drawings.

   b. The vehicle detection system shall collect and process volume and occupancy data on a lane-by-lane basis. The vehicle detection subsystem shall allow for connectivity to the TMC.

   c. Vehicle detectors must meet the Project requirements under all environmental and traffic conditions. The detection system shall produce accurate vehicle presence and provides a detection output, for all corridor traffic operation conditions. The Contractor design must limit the likelihood of occlusions, other blocking of vehicles and adjacent lanes detection that degrade the detection system performance below specified accuracy. Design the system so that signs, walls, guardrails, and other physical elements do not degrade detection performance.

   d. The system shall allow remote configuration, calibration, monitoring, and diagnostic of real-time traffic activities from a remote location, such as the TMC, using the software provided by the detection

system vendor.

e. The Contractor's Consultant shall determine the exact location of the field devices to meet the desired coverage and functional requirements of vehicle detectors. The Contractor team shall coordinate and perform a detailed site survey with a factory trained and certified representative of the detection system manufacturer being proposed in their design. The site survey must confirm that the design does not exceed the operational capabilities of the proposed detection technology or device.

3. Provide network support services to ensure the deployed technology and network function seamlessly.

4. Perform an analysis of each corridor to assess the appropriate deployment of TG3 engineering solutions. (Optional Services)

5. Perform field survey as required for developing the TG2 design plans.

6. Provide planning services to assess 'future-proof' opportunities that may guide the design services such that advances in near term technological enhancements in transportation are appropriately addressed.

E. Submittals

1. The Contractor shall submit a Submittal Schedule within fifteen (15) calendar days after the award of the Contract showing dates for submission, review, approval and required late finish date for approval of all documents required to be submitted by the Contract. This schedule will be reviewed by Miami-Dade County TSS. All changes required by Miami-Dade County TSS shall be made by the Contractor. The final schedule shall be approved Miami-Dade County TSS. The schedule shall take into account the sequence of Work and the time required to prepare and approve the various submissions. The allotments shall be reasonable within the time set for completion of the Contract. The Contractor shall ensure the required coordination related durations are included in the Schedule.

2. The Contractor and the County Project Manager must mutually define and agree on submittals review and comment resolution periods. The Contractor must provide responses and update all submittals to address all TSS and ITD comments. The Contractor must plan multiple submittal deliverables to ensure all TSS comments are addressed to the satisfaction of TSS. The Contractor must ensure that the submittals meet the Project Schedule irrespective of the number of submittals.

3. Each submittal must be accompanied by design calculations, Specifications, supporting documents and sufficient information for area of work to allow for proper evaluation of the component submitted for review. For all submittals, the Contractor must ensure each submittal follows a TSS pre-approved document control process to ensure proper version control is maintained. All submittals must be easily accessible by the Project Team.

4. At the discretion of the County Project Manager, each submittal may require multiple hardcopies and USB flash drives or other electronic hardware storage of all documents, unless noted otherwise.

5. All deliverables including but not limited to, signal design plans, traffic signal timing database, SOP and MOT plans shall be delivered to Miami-Dade County TSS Division for distribution to Miami-Dade County reviewers. The Contractor's Consultant shall allow for minimum twenty-one (21) calendar day Miami-Dade County TSS review time for the design submittals of each anticipated work package or corridor. Review by or on behalf of Miami-Dade County TSS Division must be for the benefit of the County and shall NOT relieve the Contractor's Consultant of the sole responsibility for all aspects of the design and construction. All comments must be addressed to the satisfaction of Miami-Dade County TSS prior to submission to any permitting agency. Failure to do so may result in rework by the Contractor's Consultant at no additional cost to the County.

6. Final signed and sealed, permitted (if needed), and Released for Construction (RFC) plans will be delivered to Miami-Dade County TSS a minimum of fifteen (15) calendar days prior to providing the two-week look ahead schedule of construction/installation of the component. Miami-Dade County TSS will review the final plans and stamp "Release for Construction" after that. Only stamped, signed and sealed plans are valid for construction and all work that the Contractor's Consultant performs prior to the release of Plans by Miami-Dade will be at the Contractor's Consultant's risk.

7. Contractor's Consultant shall be responsible for preparation and submittal of all shop drawings during the construction stage. The selected Contractor Consultant is also responsible for the review and approval of the shop drawings and preparation of signed and sealed as-built plans. Approved shop drawings prepared by the Contractor's Consultant shall be submitted to Miami-Dade County TSS and shall bear the approval stamp and signature of the Contractor's Consultant, the approved stamp and signature of the EOR. Miami-Dade County TSS shall review the shop drawings to evaluate the compliance with the project requirements.

8. The Contractor's team will compile and provide shop drawings / submittals, including but not limited to, the following items prior to installation:

    a. 2070LX controller hardware and software

    b. Vehicle detection system

    c. Central traffic control software (Optional Services):

        1) Basic traffic signal system control functions

        2) Traffic analysis tools including but not limited to: Synchro interface, time-space diagram, high-resolution data (FDOT SR-671-2), etc.

        3) ATSPM

        4) Adaptive traffic control solution

        5) NTCIP Center-to-Center communication solution

        6) Transit signal priority solution

        7) Emergency Route Preemption:

        8) Reversible Lane Control System (RLCS)

9. Upon review of the shop drawings/submittals, Miami-Dade County TSS Division will stamp "Release for Construction" or "Release for Construction as Noted" and initiated and dated by the reviewer. The release for Construction does not relieve the Contractor's Consultant of any liability or responsibility for errors or omissions in the shop drawings.

10. Within ninety (90) days of acceptance, the Contractor's Consultant shall provide Miami-Dade County TSS with two (2) signed and sealed sets of complete project as-built certified by a Florida Licensed Professional Engineer. As-built Plans must show all changes and deviations from the permitted plans and drawings. The Contractor's Consultant shall submit Final Record Documents/As-built plans to Miami- Dade County TSS which include, but not limited to the following document:
    a. Signalization plans
    b. Signal timing plans
    c. Signal SOP
    d. Permits
    e. Other supporting documents

F. Project Work Progress Schedule

1. Consistent with the requirements of Division 01 (General Requirements) provided as Exhibit 1, Contractor must maintain and update monthly, a detailed Critical Path Gannt Chart project schedule. The project schedule shall be prepared using the latest version of Microsoft Project Management Software. The Contractor shall submit the schedule in hard copy and electronic format. The schedule shall be updated monthly and provide with each payment application.

2. The minimum number of activities shall be those listed in the schedule of values, plus those items listed below:

   a. Notice to Proceed
   b. Design submittals (for each anticipated work package)
   c. Design review and comment resolution by Miami-Dade TSS (for each anticipated work package)
   d. Design review/Acceptance milestone (for each anticipated work package)
   e. Mandatory milestones for completion (in accordance with Article 37 of the Agreement)
      1) All Traffic Controller Software Functions for proposed 2070LX traffic controller(s) to be delivered to TSS after passing testing successfully within one hundred and eighty day (180) calendar days.
      2) Minimum of 500 of 2070LX controllers along with the local controller software are deployed, tested and provided final acceptance by TSS per year as per the Agreement.
      3) All TG1 Traffic Controllers Deployment, Substantial Completion within 5 years of NTP.
      4) TG2 Substantial Completion within 7 years of NTP
      5) TG3 Substantial Completion within 7 years of NTP
   f. Permitting (for each anticipated work package or corridor)
   g. Procurement of long-lead time items as determined by the Contractor
   h. Construction Mobilization
   i. Deployment phasing
   j. Additional construction milestone as determined by the Contractor
   k. System Integration (Optional Services)
   l. System Acceptance Testing
   m. Burn-in and Final Acceptance per each task group
      1) Controller (TG1)
      2) Detection (TG2)
      3) Section or Corridor (TG3) (Optional Services)
   n. Training
   o. Substantial Completion date for all work
   p. Final Completion date for all work

G. Meeting and Progress Reporting

1. The Contractor's project manager will host weekly formal project meetings to keep the County informed of project progress and upcoming activities. Progress meetings will be scheduled once a week and must be attended by the Contractor's project manager and the County Project Manager, along with additional staff as needed. These meetings will be used to review progress reports, open action items, upcoming activities and written correspondence exchanged since the last meeting. During these progress meetings, the Contractor is expected to discuss technical aspects of the project and to review comments on documents submitted for approval. These meetings are intended to last approximately sixty (60) minutes. The agenda for these meetings will form two purposes: to guide the discussion and function as a Progress Report. These meetings will include the following discussion points:

   a. Work performed in the prior week
   b. Work anticipated in the ensuing week
   c. Provide a detail project plan and schedule for the upcoming (four) 4 week period
   d. Outstanding issues in scope

e. Comments on submittals
f. Other issues such as coordination with FDOT/local agencies, permitting, etc.

2. The Contractor must prepare and submit all meeting minutes within 48 hours of the meeting for approval to Miami-Dade County TSS. The Contractor shall, on a monthly base, provide written progress reports that describe the items of concern and the work performed on each task.

H. Bus Route Signal Priority/Remote Route Preemption

The Contractor must provide TG1 functionality as required to support this system. The Contractor must coordinate with TSS to support this system.

I. Smart Mobility Requirements

The Contractor must provide TG1 functionality as required to support this item. The Contractor must coordinate with TSS to support this item.

J. Reversible Lane Control System (RLCS)

Reversible Lane Control System (RLCS) – Where required, provide reversible lane control using the new 2070LX controllers. The proposed 2070LX controllers and local controller software must replicate, and wherever possible, enhance reversible lane control functions currently provided by the existing traffic control systems in the vicinity of Hard Rock Stadium. The Contractor must provide all required TG1 functionality to support this existing system.

K. South Dade Transitway Bus Rapid Transit (BRT)

The Contractor must provide TG1 functionality as required to support this system. The Contractor must coordinate with TSS to support this system.

L. Design Quality Management Plan (DQMP) and Document Control

1. The Contractor shall be responsible for the professional quality, technical accuracy and coordination of all field work, design, drawings, specifications, construction, integration and other services under this contract, notwithstanding any reviews or inspections by or on behave of Miami-Dade County TSS.

2. The Contractor shall provide a DQMP which describes the Quality Control (QC) procedures to be utilized to verify, independently check and review all design drawings, signal timing database conversion (Optional Services), signal SOP, and other documentation prepared as a part of this contract. In addition, the DQMP shall establish a Quality Assurance (QA) program to confirm that the quality control procedures are followed. The Contractor shall submit a DQMP within thirty (30) calendar days of the written Notice to Proceed (NTP).

3. The Contractor shall, without any additional compensation, correct all errors in the designs, drawings, signal timing database (Optional Service), specifications and other services in a timely manner so as not to impact the project schedule.

4. No installation, integration or construction shall occur until all related design reviews and shop drawing review comments are resolved. Any construction work performed prior to approval of required documents will be at the Contractor's risk.

5. The Contractor shall submit a signed Statement with each submittal that the documents have undergone

a QC review. At the request of the County, the Contractor shall provide documentation supporting the review.

6. The Contractor must implement a Document Control and Management System (DCMS) that is compatible with the Microsoft environment and meets the ITD security requirements and compliance standards. TSS is currently utilizing Microsoft Dynamics 365 for all internal project related DCMS activities. The DCMS must be reviewed and approved by TSS prior to deployment. The DCMS must include, the following functionality, but not limited to:

    a. The DCMS must be capable of integrating with any legacy systems to ensure seamless data access and availability.

    b. The DCMS must provide an efficient and user-friendly interface for easy tracking and management of project related processes, submittals, inspections, workflows, and requests.

    c. The DCMS must customize the system to meet the specific needs of the project, ensuring a tailored solution that fits the project requirements.

    d. The DCMS must allow for the addition of third-party users, ensuring collaboration and communication with external and internal stakeholders.

    e. The DCMS must integrate email tracking feature via API (Application Parameter Interface) that ensures seamless communication between users and preventing any loss of information.

    f. The DCMS must enable traceability by facilitating easy tracking of document versions and changes, ensuring that all team members are working from the most up-to-date information.

    g. The DCMS must streamline and automate document management processes to save time and reduce the risk of errors and enhance overall project efficiency. The system must be capable to integrate the following, but not limited to:

        i. Document version, number and revision control.

        ii. Documents naming convention.

        iii. Error validation.

        iv. Ready to use templates for checklists and forms.

    h. The DCMS must allow users to create workflows for document reviews and submittals. The workflow feature must be customizable to allow multiple reviewers, add/remove reviewers during the process, change responsibility and duration for each step of workflow. The workflow must produce an outcome that can be tracked.

    i. The DCMS must allow users to create reports and save them to an asset and easily retrievable.

    j. The DCMS must allow users to create custom reports to track activities that occurred in a specific time period.

M. Construction Criteria

1. The Contractor shall establish a local office in Miami-Dade County. The local office will provide workspace for project staff as well as warehouse space to receive inventory shipments and perform local testing as

required.

2. The Contractor shall construct the work in a logical manner and in close coordination with the goals and objectives of the County. The Contractor shall take into account the work restrictions included in this document and adjacent projects which may impact the schedule of this project,

3. The Contractor shall be responsible for identifying and coordinating design and construction activities with other on-going projects that impact this project, in accordance with the Contract. This includes the projects under Miami-Dade jurisdiction, FDOT or other local agencies.

4. The Contractor shall coordinate its construction operations with other contractors within the surrounding construction area for an efficient and orderly installation of each project component.

5. The Contractor shall implement approved MOT plans showing each phase of traffic control in the case of lane closure. Failure to do so may result in fines to the Contractor at no cost to the County.

6. Miami-Dade County TSS Division will provide Construction Engineering and Inspection (CEI) and Quality Assurance Engineering (QAE) for its own purpose without relieving the Contractor of its responsibility of testing and inspection.

7. The Contractor must participate in the bench test of traffic signal control equipment used in this project prior to field installation, including but not limited to the 2070LX controller with converted timing database. If desired by TSS, the Contractor must perform the bench test for the traffic signal control equipment used in this project prior to field installation, including but not limited to the 2070LX controller with converted timing database. (Optional Service)

8. Miami-Dade County TSS Division or its representative may perform independent verification testing services for its own purpose. Miami-Dade County TSS Division or its representative may perform sampling controller database testing on site as well as in the lab. The Contractor shall make all testing documentation available/accessible for the County's representative's review at any time.

N. Project Acceptance Maintenance Responsibility, Substantial Completion (General)

1. Final Acceptance can be achieved per controller under TG1

    a. A controller shall be considered complete and ready for Final Acceptance when:

        i. The controller is installed (including data key) and has successfully cycled (has operated free of error 95% of time) through and passed the ninety (90) calendar days of Burn-in period (continuous, successful, and error-free operation). All outstanding issues identified during the ninety (90) days Burn-in Period are resolved, documented; and the controller is fully operational.

        ii. Testing is performed, all documentation including sign and sealed documents and warranty affidavit are submitted and approved by the County.

        iii. All pertinent County staff (i.e., technicians, engineers, operators, etc.) are trained.

2. Final Acceptance can be achieved per intersection under TG2

    a. An intersection detection system under TG2 shall be considered complete and ready for Final Acceptance when:

i. Testing is performed, all documentation including sign and sealed documents and warranty affidavit are submitted and approved by the County.

ii. Punch list items are addressed.

iii. The Miami Dade County TSS Construction Inspector inspects and approves the work at each intersection and an acceptance letter is provided for the completed work.

iv. Ninety (90) calendar days of continuous, successful, and error-free operation is provided as Burn-in Period. All outstanding issues identified during the ninety (90) days Burn-in Period are resolved, documented; and the controller is fully operational.

v. All pertinent County staff (i.e., technicians, engineers, operators, etc.) are trained.

3. Final Acceptance can be achieved per corridor/control section under TG3 (Optional Service)

    a. A control section or corridor under TG3 shall be considered ready for Final Acceptance when:

        i. Testing is performed, all documentation including sign and sealed documents, evaluation study of the proposed solution and warranty affidavit are submitted and approved by the County.

        ii. Ninety (90) calendar days of continuous, successful, and error-free operation is provided as Burn-in Period. All outstanding issues identified during the ninety (90) days Burn-in Period are resolved, documented; and the controller is fully operational.

        iii. All pertinent County staff (i.e., technicians, engineers, operators, etc.) are trained.

4. The Contractor's warranty will take effect in accordance with Paragraph 2.07(O). The County Project Manager's acceptance of any portion of the Work under the provisions stipulated above are subject to all applicable requirements of Article 1.03(K) of Division 01 (Exhibit 1) and Articles 1.06 and 1.07 of Section 600 (Exhibit 2).

5. Maintenance Responsibility

    a. Starts upon controller/detection installation and prior to County Acceptance of the intersection, the Contractor shall be responsible for maintenance of the intersection and **must respond to all trouble calls (irrespective of the cause of the issue)** and provide a report documenting findings and corrective actions. **The Contractor must work with TSS to develop a plan to support as first responders to all issues that come up during the controller deployment and acceptance work duration.**

    b. The date of the Final Acceptance is the effective date of release of Contractor's first responder responsibility.

6. Substantial Completion

    Substantial Completion can be achieved per Task Group when all controllers (TG1), intersections (TG2) and sections or corridors (TG3) have been accepted within such Task Group.

    a. The Substantial Completion for TG1 will be achieved once all 2070LX controllers along with the local controller software are deployed, made operational, successfully tested for fully functionality, documentation completed and submitted, and provided final acceptance by TSS. Substantial Completion for all TG1 Deployment must be achieved within 5 years from NTP.

b. The Substantial Completion for TG2 will be achieved once all the TSS approved intersections have the TG2 activities deployed, made operational, successfully tested for fully functionality, documentation completed and submitted and provided final acceptance by TSS. Substantial Completion for all TG2 must be achieved within 7 years from NTP.

c. The Substantial Completion for TG3 will be achieved once all the TSS approved corridors have the TG3 engineering solutions implemented, tested, documentation completed and submitted, and provided final acceptance by TSS. Substantial Completion for all TG3 must be achieved within 7 years from NTP. (Optional Services)

O. Final Acceptance Testing (Local Controller Software)

1. Final Acceptance testing, in order to achieve Substantial Completion in accordance with the Contract, shall be in accordance with the procedures specified in the approved acceptance test plan and shall include tests for the local controller software.

2. The Contractor must conduct all phases of the acceptance testing. Final Acceptance testing should include appropriate Contractor, CEI and the County staff and should occur at a time agreeable to both parties.

3. Final Acceptance testing must verify the following:

   a) Local controller software is properly installed and configured.

   b) All functional requirements are met.

   c) Integration of the controller with the ATMS central software and the communications network is complete and successful. (Optional Services)

   d) Controller database conversion by the Contractor is complete and valid. (Optional Services)

   e) Alarms and reports are generated as designed.

   f) Bug fixes are successful.

4. The Contractor must record all test results. Each report should follow the steps enumerated in the test procedures. The following items must be included in the test reports:

   a) Reference to the appropriate test and test procedures.

   b) Date of test.

   c) Test results for each test segment, including a pass/fail indication and any modifications made to the procedures during the test.

   d) Identification of the Contractor's tester and of the County's representative witnessing the test.

   e) Provision for comments by the County's representative.

   f) Copies of any variance reports generated.

   g) System logs or printouts saved as part of the test.

5. The Contractor's project manager must prepare a variance report each time a deviation from any part of the functional requirements is detected. Variance reports must include a complete description of the variance including the following items:

   a) A sequential ID number assigned to the variance.

   b) The date and time the variance was first discovered.

c) Variance classification (see Class descriptions below).

d) Variance status (open, closed or pending).

e) Appropriate references to the functional requirements or test procedures.

f) A description of the test conditions at the time the variance was detected and the two steps performed prior to the failure.

g) Identification of the Contractor and/or the County's representative submitting the report.

6. Variances should be classified by the County's project manager and reviewed by both project managers, with the County project manager having the final right of approval. Each variance must be assigned to one of the following three classes, depending on its severity and impact to the central traffic signal control software:

   a) Class A: A severe variance (dead crash or multiple function failure) that prevents, invalidates or significantly impairs system operations. Testing must stop for immediate evaluation and correction by the Contractor. The County reserves the option to repeat all or portions of the acceptance test plan.

   b) Class B: A significant variance (essential function failure, which means the basic and fundamental functions to support the operation of the signal system including but not limited to upload/download, compare, database saving, etc.). The County may stop testing or allow testing to continue. If testing is allowed to continue, the variance must be corrected at the end of the current session or day of test.

   c) Class C: A minor or isolated variance including annoying features (functions that do not exactly satisfy the requirements of the scope, but do not impact the operation of the signal system including but not limited to report parameters, scheduler commands, etc.). Testing will continue and the variance will be corrected and tested at a mutually agreed upon time (e.g. at the end of the test or later in the test period).

7. The Contractor shall document actions taken to correct variances. Sufficient information should be provided to enable a Miami-Dade County TSS representative to determine the need for retesting the function, for testing interaction with any previously tested function and for updating appropriate documentation as a result of the corrective action. The County must approve variance corrections that would result in a change to an approved document prior to their implementation by the Contractor.

8. The variance report should be completed when the Contractor and the County representatives acknowledge, by signatures, correction of the variance. Variance reports must be made available to the County. The Contractor must maintain and periodically distribute (frequency of distribution based on testing activity) a variance summary that lists for each variance, the variance number, functional identification, variance class and current status.

9. The test period for Final Acceptance testing will be 30 actual test days, not including days spent correcting errors or verifying that the errors have been corrected without introducing new errors. If significant errors are discovered, the County may choose to restart Final Acceptance testing with no additional cost to the County. The Contractor shall provide on-site technical support, as needed, for all components of the central hardware and software during Final Acceptance testing.

10. The County typically deploys applications into a pre-production environment initially to ensure the applications are completely functional and defect-free before transitioning the deployment to the production environment. The Contractor must coordinate with the TSS and third-party Consultant during integration of the traffic controllers into the ATMS environment (pre-production and

production).

11. Prior to any in-house/bench testing, the Contractor shall prepare a comprehensive acceptance test plan for review and approval by the County. The plan must serve as a guide to operationally test system hardware, software, and check for full functionality and operability. The plan must include a detailed description of the tests to be conducted and the purpose of each test. Each test should be mapped to at least one of the functional requirements. Test procedures, including specific steps and the sequence of steps to be followed, must be specified.

12. Prior to any field testing, the Contractor shall prepare a comprehensive acceptance test plan for review and approval by the County. The plan must serve as a guide to operationally test system hardware, software, and check for full functionality and operability. The plan must include a detailed description of the tests to be conducted and the purpose of each test. Each test should be mapped to at least one of the functional requirements. Test procedures, including specific steps and the sequence of steps to be followed, must be specified.

13. The Acceptance Test Plan shall include evaluation criteria for each test based on the functional requirements matrix. The criteria set forth by the plan will be used as the standard by which the County will judge the success or failure of each test.

14. Sample test report forms shall also be provided in the acceptance test plan. Report forms must be designed for successful tests as well as anomalies and during testing. A form to report corrective actions, including changes to the software, or hardware, must also be designed and included in the plan.

15. The Contractor shall prepare and submit the Acceptance Test Plan to Miami-Dade County TSS a minimum of 14 calendar days prior to the Acceptance test. Miami-Dade County TSS will review the acceptance test plan to ensure appropriate procedures have been designed to rigorously test the system software, hardware and integration. To assist the County in this review, the Acceptance Test Plan must include a compliance matrix that confirms the tests evaluate all functional requirements. Upon written approval from the County, the Contractor can begin acceptance testing.

P. Burn-In Period and Warranty Start Date Period

1. During the Burn-in period, the system shall provide ninety (90) calendar days of continuous, successful and error-free operation of the traffic signal control system in the County's operating environment.

2. During the Burn-in period, if applicable, if any portion of the system or services is deemed unacceptable to the County, the County will notify the Contractor within five (5) calendar days following such operation period. The Contractor shall repair or replace unacceptable traffic signal control system hardware, software, customizations or services within a mutually agreed upon time period at no additional charge to the County. Another ten (10) days of successful operation must follow any corrections or replacements.

3. If the Contractor does not correct or replace the unacceptable system component or services within the specified time period, or such system component or services are deemed unacceptable by the County, it may, at its option, return the unacceptable component to the Contractor with an explanation of why it is unacceptable. The Contractor must refund to the County any amounts paid for said component prior to Final Acceptance. Failure to replace or correct unacceptable components or services may be grounds for default.

4. The County will issue a Letter of Final Acceptance (Per Controller at an asset, Per Detection at an asset, Per TG3 segment) after the 90 days of operations are complete and all variances are resolved for each implementation phase. The established acceptance date will mark the beginning of the Contractor's initial

warranty and approval for the County to make the final milestone payment.

Q. Close Out Submittals

1. Before requesting final completion, the Contractor shall prepare and submit digital files and hard copies of the complete closeout package. At a minimum, the following items are to be included in the closeout packages for each TG1, TG2 and TG3 work:

   a. Project record documents: AutoCAD and Revit drawings, submit hard copies and electronic format
   b. Project record documents: Signal plans, submit hard copies and electronic format (PDF)
   c. Project record documents: Signal SOP plans, submit hard copies and electronic format (PDF)
   d. Operating and Maintenance user manuals and instructions for all equipment and system
   e. Warranties
   f. Data keys as per 2070LX controller requirements
   g. Spare parts and maintenance materials
   h. Evidence of payment
   i. Certification of 2070LX controller with the local software test and vehicle detection system test

R. Final Completion of the Project

Final Completion of the Project is achieved once the substantial completion is achieved for each of the Task Group activities (TG1 local controller software, each TG1 controller, each TG2 intersection, each TG3 segment or corridor) in accordance with the Contract.

2.08 MEASUREMENT AND PAYMENT

A. Compensation

1. Compensation provided by the Contract, through the various scheduled items having awarded Contract Unit Prices, constitutes full payment for completing the Work and meeting all requirements of the Project. Approved payments will be made only under items having awarded Contract Unit Prices that are measured and accepted by the County Project Manager.

2. The aforementioned compensation includes:

   a) Full payment for furnishing any material, supply, equipment, tool, labor, supervision, or meeting any requirement that is reasonably inferred or incidental to the Work whether or not specifically called for by the Contract Documents but is essentially required for the Contractor to provide a complete system as specified by the Contract.

   b) Items of work that do not have awarded Contract Unit Prices even if the items appear within the Articles of Specifications or anywhere else in the Contract Documents. These items will not be measured separately for payment. Compensation for performing any work or meeting any requirement associated with these items is included in approved payments made under the various scheduled items having awarded Contract Unit Prices.

3. Compensation provided by the Contract, shall be in accordance with Article 8 “Pricing” of the Agreement, which sets forth the amounts and methods for County payments to the Contractor.

B. Schedule of Values

1. A Schedule of Values is required for any lump sum items and unit prices.

2. Upon notification of intent to Award and prior to the Notice to Proceed, Contractor must submit to County Project Manager for review and approval, a preliminary Schedule of Values that:

   a. Logically subdivides the Work covered by the lump sum item into component parts with sufficient detail to serve as the basis for progress payments during performance of the Work and correlates to the Work Progress Schedule.

   b. Includes quantities and prices of items for all of the Work which when added together equal the Contract Unit Price for the lump sum item.

3. The Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Lump Sum Item to component parts of the Work under said Item.

4. The Contractor will be required to submit at least 10 days prior to the next application for progress payment, a revised or updated Schedule of Values to address any changes in the Work.

C. Method of Measurement

1. Task Group 1: Traffic Signal Controller and Local Controller Software

   a. System Delivery

      The Contract unit price includes all costs, fees, materials and labor for work required for Project initiation and planning, system configuration, system construction, system acceptance, testing, system implementation, training and software maintenance support (Five Years) and any other required work not already provided elsewhere in the Contract prices.

   b. Caltrans Model 2070LX controller with local controller software

      a. The Contract unit price is for each Miami-Dade County approved Caltrans Model 2070LX Controller including local controller software furnished, delivered, and received by the TSS Division Warehouse at 7100 NW 36 Street, Miami, FL 33166.

      b. Traffic Signal Controller must meet the requirements of Miami-Dade County Traffic Control Equipment Standards and Specifications Section 671 (Traffic Signal Controllers) and include County approved local controller software license.

      c. Controllers must be delivered in batches not to exceed 25 controllers with a total “on-hand” inventory at the TSS Division Warehouse not to exceed 100 controllers at any time.

      d. Final total quantities of controllers may vary from at least a minus (-) 20 percent to a plus (+) 10 percent of the estimated quantity of controllers.

   c. Adjust/Modify existing Caltrans Model 2070LX controller (1C Module w/local controller software)

      a. The Contract unit price is for each Miami-Dade County approved Adjust/Modify of existing Caltrans Model 2070LX controller with a new 1C Module including local controller software furnished, delivered, and received by the TSS Division Warehouse at 7100 NW 36 Street, Miami, FL 33166.

      b. The Contract unit price also includes all costs necessary for pre-inspection of intersection equipment, TG1 field survey report per asset, adjust/modify the controller in the field, onsite verification of intersection operation, documentation, returning replaced parts to the TSS Division, any troubleshooting calls prior to substantial completion.

c. Traffic Signal Controller must meet the requirements of Miami-Dade County Traffic Control Equipment Standards and Specifications Section 671 (Traffic Signal Controllers) and include County approved local controller software license.

d. Final total quantities of controllers may vary from at least a minus (-) 20 percent to a plus (+) 10 percent of the estimated quantity of controllers.

d. Controller Field Installation

a. Includes all costs necessary for pre-inspection of intersection equipment, TG1 field survey report per asset, replacement of Model D170E controller with Caltrans Model 2070LX Controller, onsite verification of intersection operation, documentation, returning Model D170E controller to the TSS Division, any troubleshooting calls prior to substantial completion.

b. Final total quantities of Controller Field Installation may vary from at least a minus (-) 20 percent of the estimated quantity of intersections.

e. Annual Local Controller Software Maintenance Support (After Year 5)

a. The Contract unit price is the full annual cost to provide the required Software Maintenance Support following the first five full Calendar years after TG1 Substantial Completion issued by the County. The cost of Annual Software Maintenance Support before Year 5 is to be included in the lump sum price for System Delivery and Integration.

f. Onsite Controller Expert Staff (First 5 Years)

a. Negotiated professional services salary, per employee, for two full-time employees throughout the 5-year contract term

g. Annual Systems Training (After Year 5)

a. The Contract unit price is the full annual cost to provide the required Systems Training following first five full Calendar years after TG1 Substantial Completion by the County.

h. System Integration (Optional Service)

In the event Miami-Dade County decides to execute this item, the Contract unit price includes all costs, fees, materials and labor for work required for integrating the proposed TG1 traffic controllers with the new ATMS central software system specified in the Contract Documents including County acceptance, and any additional training and required by the Contract Documents not already provided elsewhere in the Contract prices.

i. Intersection Database Migration (Optional Service)

a. Includes all database conversion and migration, programming, testing, validation, documentation necessary for the release by the County of a controller for field installation. Price to be paid is each per intersection.

b. Final total quantities of intersections may vary to a minus (-) 20 percent to a plus (+) 10 percent of the estimated quantity of intersections.

j. Onsite Controller Expert Staff (After Year 5) (Optional Service)

a. Negotiated professional services salary, per employee, for two full-time employees throughout the 5-year contract term

k. Update the System Engineering Documents provided as Exhibit 11 (Optional Service)

In the event Miami-Dade County decides to execute this item, the Contract unit price includes all the work required to update the Systems Engineering Documents. Price is to be paid as lump sum.

l. ATMS Central Software (Optional Service)

In the event Miami-Dade County decides to execute this item, the Contract unit price includes all software and hardware costs necessary for providing a complete ATMS central software system, including but not limited to system integration, configuration, construction, acceptance, testing, implementation, architecture design, security design, deployment plan and schedule, database documentation, technical and user documentation, test plans and checklists, required software licenses for a 30 year period, system and maintenance support, acceptance tests and validations, training and training material, labor, coordination, comment resolution, necessary communication and revisions, all periodic updates and releases, all system reports and functionalities equal to or exceeding those of the existing central software systems, and any additional items required by the Contract Documents not already provided elsewhere in the Contract prices.

m. Adjust/Modify existing Caltrans Model 2070LX update with 3rd party local controller software (Optional Service)

   a. The Contract unit price is for each Miami-Dade County approved Adjust/Modify of existing Caltrans Model 2070LX controller with a new third party local controller software furnished, delivered, and received by the TSS Division Warehouse at 7100 NW 36 Street, Miami, FL 33166.

   b. The Contract unit price also includes all costs necessary for pre-inspection of intersection equipment, TG1 field survey report per asset, adjust/modify the controller in the field, onsite verification of intersection operation, documentation, returning replaced parts to the TSS Division, any troubleshooting calls prior to substantial completion.

   c. Traffic Signal Controller must meet the requirements of Miami-Dade County Traffic Control Equipment Standards and Specifications Section 671 (Traffic Signal Controllers) and include County approved local controller software license.

   d. Final total quantities of controllers may vary from at least a minus (-) 20 percent to a plus (+) 10 percent of the estimated quantity of controllers.

2. Task Group 2: Actuation of Signalized Intersections

   a. Engineering Design: Includes all documentation and work necessary for phased plan submittals of complete Traffic Signal plans following the latest Florida Design Manual (FDM), MDC TSS Signalization Design Manual and the MDC Traffic Control Equipment Standards and Specifications (TCESS).

      1) Full signalization plans including survey. In addition, signalization plans must adhere to applicable requirements contained in the FDM, Miami-Dade County Standards, FDOT TEM, Manual on Uniform Traffic Control Devices (MUTCD), National Electric Code (NEC), and Americans with Disabilities Act (ADA) Standards for Accessible Design.

         The following sections outline the requirements issued by TSS to be included as part of submitted signalization plans for review.

         - Key Sheet
         - Signature Sheet
         - Summary of Quantities (Miami-Dade County Specific)
         - Naming convention
         - Mast Arm Tabulation
         - General Notes
         - Device Data sheet
         - Project Layout
         - Signalization Plan Sheet
         - Pole Schedule
         - Mast Arm Details

- Detection Installation Details
- Mounting details
- Cabinet details
- Wiring Details
- Splicing diagrams (if applicable)
- Power service details (if applicable)

2) Structural Analysis. The need for structural analysis when installing detection sensors is defined in FDOT D6 Structures Design Section dated November 2018. Specifically, for Miami Dade County mast arms with no back plates on any signals, a structural analysis shall not be required when:

   a) Only one (1) sensor may be mounted, and the arm length is 50 feet or shorter.

   b) Two (2) sensors may be mounted, and the arm length is 52 feet or longer.

   For all other cases, a structural analysis shall be provided as part of the design plans.

b. Construction (Furnish and Install):

1) Concrete Sidewalk

   a) Must meet all requirement of Section 522 (Concrete Sidewalk And Driveways) of the FDOT Standard Specifications for Road and Bridge Construction except:

      a. Class I Concrete must have a minimum compressive strength of 3,000 psi. at 28 days.

      b. The quantity to be paid for will be the area in square yards of concrete sidewalk and pedestrian ramps, measured in place, complete and accepted. Measurement shall be the final dimensions measured along the surface of the completed work within the neat lines shown on the Plans or designated by the Engineer. No deduction will be made for the area occupied by trees left within the area of sidewalks or for any area occupied by manholes, inlets or other drainage or public utility appurtenances within the sidewalk area.

      c. The quantity, determined as provided above, will be paid for at the Contract unit price for the quantities completed and accepted by Engineer. Such price and payment shall be full compensation for all work specified under this Section.

      d. When curb and gutter is required for the construction of pedestrian ramps and no specific pay item has been included for the construction of the curb and gutter, such payment shall be included in the pay item for Sidewalk (including pedestrian ramps and sidewalk curbs).

      e. No separate payment shall be made for the removal of forms or the filling of excavated area left by removal of forms. Contractor is responsible for any vandalized sidewalk until it is finally accepted by the Engineer.

2) Detectable Warnings on Walking Surfaces

   a) Must meet all requirement of Miami-Dade DTPW Specification Section 527 (Detectable Warnings on Walking Surfaces) Exhibit 13 to the Scope of Work (Attachment B).

   b) The quantity to be paid for will be the area, in square feet, of Detectable Warnings furnished and installed pursuant to the aforementioned specification, measured in place and accepted by the Engineer.

3) Conduit

   a) Must meet all requirements of Section 630 (Conduit) of the Miami-Dade County Traffic Control Equipment Standards and Specification for acceptance.

b) The Contract unit price per foot of conduit, furnished and installed, will include furnishing all hardware and materials and all testing as specified in this Section and the Contract Documents, and all labor, casings, removal of excavated materials and spoils, removal and disposal of drilling fluids, locate wire, trenching, boring, backfilling, flowable fill and restoration materials necessary for a complete and accepted installation.

c) Payment for conduit placed underground will be based on the horizontal length of the trench or bore measured in a straight line between the centers of pull boxes, cabinets, poles, etc., in linear feet, regardless of the length or number of conduits installed. No allowance will be made for sweeps or vertical distances below the ground.

d) Payment for conduit placed aboveground or bridge mounted will be based on the actual length of conduit installed.

e) Price and payment will be full compensation for all work specified in this Section.

f) Payment for conduit placed under existing turf will be made as open trench.

g) Payment for conduit placed under existing pavement (roadway, driveways, or sidewalk) will be made as directional bore. If conduit is being placed under both existing turf and existing pavement between two pull boxes, payment for the total pull box-to-pull box length will be made as directional bore. Payment for conduit placed by jack & bore will be made as jack & bore, for the total pull box to pull box length.

h) No additional payment will be made for multiple conduits in the same trench.

i) No payment adjustment will be made if Contractor chooses to use an alternative method approved by County Project Manager.

j) No payment will be made for failed bore paths, injection of excavatable flowable fill, products taken out of service, or incomplete installations.

4) Traffic Control Cable (any conductor)

a) Must meet all requirements of Section 632 (Signal Cable) of the FDOT Standard Specifications for Road and Bridge Construction

b) Furnishing and installing will include furnishing all material, hardware, support wire, cable ties, cable clamps, lashing wire, terminal connectors, cable grounding and labor necessary for a complete and accepted installation.

c) The cost of all repairs and replacement of traffic control/signal cables is included with this pay item.

d) Install underground and aerial signal cables following the latest FDOT and MDC standards. Except for mast arm assemblies, install signal cable in continuous lengths between the traffic signal controller cabinets, disconnect hangers (or signal heads for non-span wire installations), pedestrian signal heads, and pedestrian detectors. Do not use the neutral return conductor for pedestrian detectors as a neutral return for any other device.

5) Pull Box

a) Must meet all requirements of Section 635 (Pull, Splice, and Junction Boxes) of the Miami-Dade County Traffic Control Equipment Standards and Specification for acceptance.

b) The Contract unit price each for pull, splice, and junction box, furnished and installed, will consist of the pull, splice, and junction box including all required hardware for the type of box and location as specified in the Contract Documents, and all labor and materials necessary for a complete and accepted installation.

c) No separate payment will be made for the removal of pull, splice, and junction boxes.

6) Electrical Power Service Assembly

   a) Must meet all requirements of Section 639 (Electrical Power Service Assembly) of the Miami-Dade County Traffic Control Equipment Standards and Specification for acceptance.

   b) The Contract unit price per assembly includes all labor, equipment, material, and services for a complete and accepted installation as specified and described herein and in the Contract Documents including the coordination of service with the electrical power company and connecting to the supplied power company electrical source. Materials include all conduit, electrical service wire, pull boxes, meter socket, service disconnect(s), grounding, surge protective device, and miscellaneous appurtenances needed for a complete installation. Measurement and payment for concrete strain pole(s) provided under a separate Contract pay item. This pay item shall include the complete removal of the existing electrical power service assembly.

7) Prestressed Concrete Pole, Type P-II Service

   a) Must meet all requirements of Section 641 (Prestressed Concrete Poles) of the Miami- Dade County Traffic Control Equipment Standards and Specification for acceptance.

   b) The Contract unit price for prestressed concrete poles, furnish and install, will consist of the pole plus all labor, concrete when required for the foundation and other materials necessary for a complete and accepted installation as specified in the Contract Documents.

8) Prestressed Concrete Pole, Remove

   a) Must meet all requirements of Section 641 (Prestressed Concrete Poles) of the Miami- Dade County Traffic Control Equipment Standards and Specification for acceptance.

   b) The Contract unit price for prestressed concrete poles, remove, will consists of the removal of each pole, including the foundation and all accessories and attachments, to a depth of not less than 4 feet below existing grade.

   c) Restore the construction area to an acceptable condition. Such work includes repair or replacement of all pavement areas, sidewalks, driveways, curbs, structures, landscaping, grass areas (including removal of excavated materials and spoils).

9) Aluminum Poles, Pedestals, and Posts

   a) Must meet all requirement of Section 646 (Aluminum Poles, Pedestals, and Posts) of the FDOT Standard Specifications for Road and Bridge Construction except that pedestrian signal assemblies used must also be on the Miami-Dade County TSSQPL.

   b) The Contract unit price per each for aluminum pedestals and posts, furnished and installed, will include all materials and equipment as specified in the Contract Documents, and all labor and materials necessary for a complete and accepted installation.

   c) Payment for removal of aluminum poles will include the complete removal of the pole and foundation, pedestrian detector and pedestrian signal. Separate payment for the removal of the pedestrian detector and pedestrian signal will be made only when the pole/pedestal is to remain.

   d) Payment for grounding will be incidental to the pedestal or post.

10) Pedestrian Signal Assemblies

   a) Must meet all requirement of Section 653 (Pedestrian Signal Assemblies) of the FDOT Standard Specifications for Road and Bridge Construction except that pedestrian signal assemblies used must also be on the Miami-Dade County TSSQPL.

b) The Contract unit price per assembly for pedestrian signal assembly, furnished and installed, (including mounting hardware but not including poles or pedestals) will include all materials and equipment as specified in the Contract Documents, and all labor and materials necessary for a complete and accepted installation.

c) Payment for removal of pedestrian signal assemblies will be made only when the pole/pedestal is to remain. Otherwise, the removal of pedestrian signal assemblies are included in the removal of the pole or pedestal.

11) Inductive Loops

a) Must meet all requirements of Section 660 (Vehicle Detection System) of the Miami-Dade County Traffic Control Equipment Standards and Specification for acceptance.

b) The Contract unit price for each Inductive Loop Detector furnished and installed at the traffic signal cabinet includes all labor, equipment, testing and configuration necessary for a complete and accepted installation.

c) The Contract unit price for each Loop Assembly, furnished and installed, will include all equipment, labor, equipment, and materials necessary for a complete and accepted installation of the entire loop assembly as specified in the Contract Documents including the shielded lead-in cable into the traffic signal cabinet, proper termination, and testing.

12) Microwave Vehicle Detection System

a) Must meet all requirements of Section 660 (Vehicle Detection System) of the Miami-Dade County Traffic Control Equipment Standards and Specification for acceptance.

b) The Contract unit price for Microwave Vehicle Detection System (MVDS), Cabinet Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the MVDS installation at each traffic signal cabinet location. Existing detection equipment not utilized by this project shall be removed as part of this pay item and securely returned to TSS Division.

c) The Contract unit price for Microwave Vehicle Detection System (MVDS), Above Ground Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, routing of cables and wiring properly terminating inside the traffic signal cabinet, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the above ground MVDS work for each intersection approach. Existing detection equipment not utilized by this project shall be removed as part of this pay item and securely returned to TSS Division.

13) Video Vehicle Detection System

a) Must meet all requirements of Section 660 (Vehicle Detection System) of the Miami-Dade County Traffic Control Equipment Standards and Specification for acceptance.

b) The Contract unit price for Video Vehicle Detection System (VVDS), Cabinet Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the VVDS installation at each traffic signal cabinet location. Existing detection equipment not utilized by this project shall be removed as part of this pay item and securely returned to TSS Division.

c) The Contract unit price for Video Vehicle Detection System (VVDS), Cabinet Equipment, installed only, includes all materials, tools, labor, equipment, approved mounts and

hardware, supplies, support, testing, calibration, and incidentals necessary to complete the VVDS installation at each traffic signal cabinet location. Existing detection equipment not utilized by this project shall be removed as part of this pay item and securely returned to TSS Division.

d) The Contract unit price for Video Vehicle Detection System (VVDS), Above Ground Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, routing of cables and wiring properly terminating inside the traffic signal cabinet, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the above ground VVDS work for each camera. Existing detection equipment not utilized by this project shall be removed as part of this pay item and securely returned to TSS Division.

e) The Contract unit price for Video Vehicle Detection System (VVDS), Above Ground Equipment, installed only, includes all materials, tools, labor, equipment, approved mounts and hardware, routing of cables and wiring properly terminating inside the traffic signal cabinet, supplies, support, testing, calibration, and incidentals necessary to complete the above ground VVDS work for each camera. Existing detection equipment not utilized by this project shall be removed as part of this pay item and securely returned to TSS Division.

14) Multi-Sensor Vehicle Detection System

a) The Contractor shall submit a Technical Special Provision for the specific use under this project for TSS review and approval.

b) Must meet all requirements of Section 660 (Vehicle Detection System) of the Miami-Dade County Traffic Control Equipment Standards and Specification and must be on the Miami-Dade County TSSQPL.

c) The Contract unit price for Multi-Sensor Vehicle Detection System (MSVDS), Above Ground Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, routing of cables and wiring properly terminating inside the traffic signal cabinet, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the above ground MSVDS work for each sensor.

d) The Contract unit price for Multi-Sensor Vehicle Detection System (MSVDS), Above Ground Equipment, installed, includes all materials, tools, labor, equipment, approved mounts and hardware, routing of cables and wiring properly terminating inside the traffic signal cabinet, supplies, support, testing, calibration, and incidentals necessary to complete the above ground MSVDS work for each sensor.

15) Pedestrian Detection System

a) Must meet all requirement of Section 665 (Pedestrian Detection System) of the FDOT Standard Specifications for Road and Bridge Construction except that pedestrian signal assemblies used must also be on the Miami-Dade County TSSQPL.

b) The Contract unit price for pedestrian detectors, will be paid per each, and will include the pedestrian actuation sign, all mounting hardware, wiring, materials and equipment, and all labor and miscellaneous materials necessary for a complete and accepted installation.

c) Payment for poles, pedestals, and posts will be made under their respective pay item numbers.

16) Traffic Controller Assembly (Controller with Cabinet) Furnish and Install (Optional Services)

a) Must meet all requirement of Section 670 (Traffic Controller Assemblies) of the FDOT

Standard Specifications for Road and Bridge Construction except that all furnished equipment including traffic controllers and controller cabinets must also be on the Miami-Dade County TSSQPL.

b) The Contract unit price per assembly for traffic controller assembly will include all labor, equipment, and miscellaneous materials necessary for a complete and accepted installation. No separate payment will be made under this item for wiring, programming, signal operating plan, or any other modifications needed to complete the installation.

c) Payment for removal of existing traffic controller assemblies (including but not limited to traffic controllers, controller cabinets and foundations) and any other ancillary elements required for a complete and accepted installation is included in this pay item.

17) Traffic Controller Assembly (New Foundation) Install Only (Optional Services)

a) Must meet all requirement of Section 670 (Traffic Controller Assemblies) of the FDOT Standard Specifications for Road and Bridge Construction except that equipment as controller cabinet and traffic controller, as required, will be furnished by MDC TSS Department. The furnished controller cabinet shall be installed on a new foundation.

b) The Contract unit price per assembly for traffic controller assembly will include all labor, equipment, and miscellaneous materials necessary for a complete and accepted installation. No separate payment will be made under this item for wiring, programming, signal operating plan, or any other modifications needed to complete the installation.

c) Payment for removal of existing traffic controller assemblies (including but not limited to traffic controllers, controller cabinets and foundations) and any other ancillary elements required for a complete and accepted installation is included in this pay item.

18) Traffic Controller Assembly (Existing Foundation) Install Only (Optional Services)

a) Must meet all requirement of Section 670 (Traffic Controller Assemblies) of the FDOT Standard Specifications for Road and Bridge Construction except that equipment as controller cabinet and traffic controller, as required, will be furnished by MDC TSS Department. The furnished controller cabinet shall be installed on an existing foundation.

b) The Contract unit price per assembly for traffic controller assembly will include all labor, equipment, and miscellaneous materials necessary for a complete and accepted installation. No separate payment will be made under this item for wiring, programming, signal operating plan, or any other modifications needed to complete the installation.

c) Payment for removal of existing traffic controller assemblies (including but not limited to traffic controllers and controller cabinets) and any other ancillary elements required for a complete and accepted installation is included in this pay item.

19) Accessible (Audible/Tactile) Pedestrian System Assemblies (Optional Services)

a) Must meet all requirement of Section 665 (Pedestrian Detection System) of the FDOT Standard Specifications for Road and Bridge Construction except that pedestrian signal assemblies used must also be on the Miami-Dade County TSSQPL.

b) The Contract unit price per assembly for accessible pedestrian system assembly, furnished and installed, (including mounting hardware but not including poles or pedestals) will include all electronic equipment, mounting hardware, power supplies, push buttons, and sign faces which are designed to both a raised vibrating tactile arrow along with a variety of audible sounds for different traffic signal functions, as specified in the Contract Documents, and all labor and materials necessary for a complete and accepted installation.

c) Payment for removal of pedestrian signal assemblies will be made only when the pole/pedestal is to remain. Otherwise, the removal of pedestrian signal assemblies is

included in the removal of the pole or pedestal.

20) Clearing and Grubbing

a) Must meet all requirement of Miami-Dade DTPW Specification Section 110 (Clearing and Grubbing) Exhibit 14 to the Scope of Work (Attachment B).

b) No Direct Payment Provided: The cost of any work of clearing and grubbing necessary for the proper construction of the Project is included in the Contract price for the structure or other item of work for which such clearing and grubbing is required; therefore no separate payment will be made for clearing and grubbing.

21) Mobilization

a) Must meet all requirement of Section 101 (Mobilization) of the FDOT Standard Specifications for Road and Bridge Construction.

b) No Direct Payment Provided: All work and costs specified as being covered under the aforementioned specification is included for payment under the several scheduled items of the overall Contract; therefore no separate payment will be made for Mobilization.

22) Maintenance of Traffic

a) Must meet all requirement of Section 102 (Maintenance of Traffic) of the FDOT Standard Specifications for Road and Bridge Construction.

b) No Direct Payment Provided: All work and costs specified as being covered under the aforementioned specification is included for payment under the several scheduled items of the overall Contract; therefore no separate payment will be made for Maintenance of Traffic.

c) The County will reimburse Contractor from the contract allowance, for the Direct Out-of-Pocket cost(s) associated with the utilization of Police Officers for the direction of traffic as a requirement of MOT. The contractor must obtain TSS approval prior to any work that may require reimbursable police presence.

3. Task Group 3: Miscellaneous Engineering Implementation (Optional Service)

a) Engineering services and software development necessary for implementing features and functionality will be based on specific engineering tasking assignments to be paid at negotiated units for hourly rates or on a per intersection bases for professional services, in accordance with the Proposal Price Schedule.

D. Basis of Payment

1. Task Group 1: Traffic Signal Controller and Local Controller Software

Item #	Description	Unit
1.1	System Delivery	LUMP SUM
1.2	Caltrans Model 2070LX Controller with Local Controller Software	EA
1.3	Adjust/ Modify Existing Caltrans Model 2070LX Controller (1C Module w/ Local Controller Software)	EA
1.4	Controller Field Installation	EA
1.5	Annual Local Controller Software Maintenance Support (After Year 5)	YEAR
1.6	Onsite Controller Expert Staff (2 person on-site) (First 5 Years)	YEAR

SCOPE OF WORK

Item #	Description	Unit
1.7	Annual Systems Training (After Year 5)	EA
Optional Items		
1.8	System Integration	LUMP SUM
1.9	Intersection Database Migration	EA
1.10	Onsite Controller Expert Staff (2 person on-site) (After Year 5)	YEAR
1.11	Update the System Engineering Documents provided as Exhibit 11	LUMP SUM
1.12	ATMS Central Software (Including System Delivery)	LUMP SUM
1.13	Adjust/Modify Existing Caltrans Model 2070LX Update with 3rd Party Local Controller	EA

2. Task Group 2: Actuation of Signalized Intersections

Item #	Description	Unit
2.1	Full Signalization Plans including survey (Task Group 2)	EA
2.2	Structural Analysis (Task Group 2)	EA
522-2 (1)	Concrete Sidewalk and Driveways, 4" Thick	SY
522-2 (2)	Concrete Sidewalk and Driveways, 6" Thick	SY
527-2	Detectable Warnings	SF
630-2-11	Conduit, F&I, Open Trench	LF
630-2-12	Conduit, F&I, Directional Bore	LF
632-7-1A	Traffic Control Cable (11-21 conductor)	LF
632-7-1B	Traffic Control Cable (4-7 conductor)	LF
635-2-11	Pull & Splice Box, F&I, 13" X 24" Cover Size	EA
635-2-12	Pull & Splice Box, F&I, 24" X 36" Cover Size	EA
639-2-121	Electrical Power Service, F&I, Underground, Meter Furnished By Power Company	AS
641-2-12M	Prestressed Concrete Pole, F&I, Type P-II Service (16 feet)	EA
641-2-60	Prestressed Concrete Pole, Complete Pole Removal Pedestal/Service Pole	EA
646-1-11	Aluminum Signal Pole, F&I, Pedestal	EA
646-1-12	Aluminum Signal Pole, F&I, Pedestrian Detector Post	EA
646-1-60	Removal of Existing Pedestrian Signal Pole	EA
653-1-11	Pedestrian Signal, F&I, LED-Count Down, 1 direction	EA
653-1-12	Pedestrian Signal, F&I, LED-Count Down, 2 direction	EA
653-1-60	Removal of Existing Pedestrian Signal, Pole/Pedestal to remain	EA
660-1-109C	Inductive Loop Detector, F&I	EA
660-2-106	Loop Assembly, F&I, Type F	AS

SCOPE OF WORK

Item #	Description	Unit
660-2-106M	Loop Assembly, F&I, Type F Modified (Bicycle)	AS
660-3-11	Vehicle Detection System- Microwave, F&I Cabinet Equipment	EA
660-3-12	Vehicle Detection System- Microwave, F&I Above Ground Equipment	EA
660-4-11	Vehicle Detection System- Video, F&I Cabinet Equipment	EA
660-4-12	Vehicle Detection System- Video, F&I Above Ground Equipment	EA
660-4-12A	Multi-Sensor Vehicle Detection System, F&I Above Ground Equipment	EA
660-4-31	Vehicle Detection System- Video, Install Cabinet Equipment	EA
660-4-32	Vehicle Detection System- Video, Install Above Ground Equipment	EA
660-4-32A	Multi-Sensor Vehicle Detection System, Install Above Ground Equipment	EA
665-1-11	Pedestrian Detector, Standard	EA
665-1-60	Removal of Existing Pedestrian Detector, Pole/Pedestal to remain	EA
Optional Items		
670-5-140	Traffic Controller Assembly (Controller with cabinet) F&I	EA
670-5-300	Traffic Controller Assembly, Install (New Foundation)	AS
670-5-300A	Traffic Controller Assembly, Install (Existing Foundation)	AS
685-163	Accessible (Audible/Tactile) Pedestrian System, F&I	AS

3. Task Group 3: Miscellaneous Engineering Implementation (Optional Services)

a. Engineering services and software development necessary for implementing features and functionality which are not specified in the work pertaining to TASK GROUP 1 and 2 may be requested by the Department. Engineering services and software development efforts will be measured per hour, and paid for at the unit price upon validation and acceptance.

b. The County does not guarantee any maximum or minimum quantity, any range of quantities, or the exact quantities shown for each Pay item.

Item #	Optional Items Description	Unit
3.1	Update the System Engineering Documents provided as Exhibit 12	LUMP SUM
3.2	Review and optimize existing traffic signal parameters and timing plans	INTERSECTION
3.3	Design, configure and implement Advanced Engineering Solutions	INTERSECTION
3.4	Construction Project Manager	HOUR
3.5	Superintendent	HOUR
3.6	Traffic Signal Crew including Bucket truck and tooling	HOUR
3.7	Design Project Manager	HOUR
3.8	Discipline (Signal) Lead	HOUR

SCOPE OF WORK

Item #	Optional Items Description	Unit
3.9	Senior Engineer	HOUR
3.10	Project Engineer	HOUR
3.11	Engineer	HOUR
3.12	Engineer Intern	HOUR
3.13	CADD Technician	HOUR
3.14	Clerical	HOUR
3.15	Designer	HOUR
3.16	Utility Coordinator	HOUR
3.17	Task Manager	HOUR
3.18	Principal Engineer	HOUR
3.19	Support Engineer	HOUR
3.20	Senior Software Developer	HOUR
3.21	Software Developer	HOUR

DTPW SPECIFICATIONS

GENERAL REQUIREMENTS

TABLE OF CONTENTS

1. GENERAL REQUIREMENTS

1. GENERAL REQUIREMENTS

1.01 DEFINITIONS AND TERMINOLOGY

A. General

1. These Specifications are written to the proposers, prior to award of the Contract, and to Contractor.

2. Where sentences directing work or other action appear in the active voice-imperative mood, without a subject, the subject "bidder" or "Contractor" is understood. In any other case where the subject is not clearly understood, Engineer will make a clarification and final determination as to the subject of the action.

B. Governing Regulations and Standard References

1. The following Standards and Governing Regulations, as amended by the Contract Documents, are hereby incorporated by reference:

a. Building Code as set forth in Chapter 8 of the Code of Miami-Dade County.

b. Public Works Manual of Metropolitan Dade County (Public Works Manual).

c. United States Department of Justice's 2010 ADA Standards For Accessible Design

d. Miami-Dade County's Traffic Control Equipment Specifications and Standards for The Metro Traffic Control System Miami-Dade County (TCESS).

e. Florida Department of Transportation's Standard Plans for Road and Bridge Construction (FDOT Standard Plans).

http://www.fdot.gov/design/standardplans/SPRBC.shtm

f. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (Divisions II & III), Special Provisions and Supplemental Specifications

http://www.fdot.gov/programmanagement/Implemented/SpecBooks/default.shtm

g. Florida Department of Transportation Surveying and Mapping Procedure

http://fdotwp1.dot.state.fl.us/ProceduresInformationManagementSystemInternet/FormsAndProcedures/ViewDocument?topicNum=550-030-101

h. Florida Department of Transportation Drainage Manual

http://www.fdot.gov/roadway/Drainage/Manualsandhandbooks.shtm

i. Florida Department of Transportation Soils and Foundations Handbook

http://www.fdot.gov/structures/DocsandPubs.shtm

j. Florida Department of Transportation Structures Manual

http://www.fdot.gov/structures/DocsandPubs.shtm

k. Florida Department of Transportation Current Structures Design Bulletins

http://www.fdot.gov/structures/Memos/currentbulletins.shtm

l. Manual on Uniform Traffic Control Devices (MUTCD)

https://mutcd.fhwa.dot.gov/

m. Safe Mobility For Life Program Policy Statement

http://www.fdot.gov/traffic/TrafficServices/SafetyisGolden.shtm

n. Florida Department of Transportation American with Disabilities Act (ADA) Compliance

http://www.fdot.gov/roadway/ada/

o. Florida Department of Transportation Florida Sampling and Testing Methods

http://www.fdot.gov/materials/administration/resources/library/publications/fstm/disclaimer.shtm

p. Florida Department of Transportation Flexible Pavement Coring and Evaluation Procedure

http://www.fdot.gov/materials/administration/resources/library/publications/materialsmanual/documents/v1-section32-clean.pdf

q. Florida Department of Transportation Design Bulletins and Update Memos

http://www.fdot.gov/roadway/Bulletin/

r. Florida Department of Transportation Utility Accommodation Manual

http://www.fdot.gov/programmanagement/utilities/default.shtm

s. Florida Department of Transportation Flexible Pavement Design Manual

http://www.fdot.gov/roadway/pm/pcs/flexiblepavementmanual.pdf

t. Florida Department of Transportation Rigid Pavement Design Manual

http://www.fdot.gov/roadway/pm/pcs/rigidpavementmanual.pdf

u. Florida Department of Transportation Pavement Type Selection Manual

http://www.fdot.gov/roadway/pm/Publications/PTSM.pdf

v. Florida Department of Transportation Traffic Engineering Manual

http://www.fdot.gov/traffic/trafficservices/Studies/TEM/TEM.shtm

w. Florida Department of Transportation Bicycle and Pedestrian Policies and Standards

http://www.fdot.gov/roadway/bikeped/default.shtm

x. Federal Highway Administration Hydraulic Engineering Circular Number 18 (HEC 18).

https://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm

y. Florida Department of Transportation Manual of Uniform Minimum Standards for Design,

Construction and Maintenance for Streets and Highways (Florida Greenbook)

http://www.fdot.gov/roadway/floridagreenbook/fgb.shtm

z. Florida Department of Transportation Project Development and Environment Manual, Parts 1 and 2

http://www.fdot.gov/environment/pubs/pdeman/pdeman1.shtm

aa. Florida Statutes

http://www.leg.state.fl.us/statutes/

bb. Miami-Dade County and Local Municipal Ordinances.

2. The above list is not all inclusive and it is the responsibility of Contractor to comply with all applicable requirements whether included in this list or not. Additional project-specific criteria are provided throughout the Contract Documents

3. The above referenced Standards are intended to supplement, not supersede the requirements set forth herein and, unless otherwise noted, the latest revision shall apply. Where differences occur between referenced Standards and these Contract Documents, the more stringent shall apply unless otherwise noted in the Contract Documents or directed by Engineer in writing.

4. FDOT Standard Specifications.

a. FDOT Standard Specifications for Road and Bridge Construction (Divisions II & III), as amended by the Contract Documents, apply to an Article within these Specifications when:

1) The applicable FDOT Standard Specification Section (e.g. FDOT SECTION 415) is referenced in the title of the Article; or

2) The FDOT Standard Specification section, article, or subarticle is referenced within the Article (e.g. FDOT Section 415, FDOT 415-3; FDOT 415-5.1, etc.)

C. Abbreviations

The following abbreviations, when used in the Contract Documents, represent the full text shown.

AAN	American Association of Nurserymen, Inc.
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	The Associated General Contractors of America, Inc.
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects.
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute, Inc.
APL	FDOT Approved Product List
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
CFR	Code of Federal Regulations
CRSI	Concrete Reinforcing Steel Institute
EASA	Electrical Apparatus Service Association
EPA	Environmental Protection Agency of the United States Government
F.A.C.	Florida Administrative Code
FBC	Florida Building Code
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FM	Florida Method or Florida Sampling and Testing Method
F.S.	Florida Statutes
FSS	Federal Specifications and Standards
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IMSA	International Municipal Signal Association
IPCEA	Insulated Power Cable Engineers Association
ISO	International Organization for Standards
MDC	Miami-Dade County
MSTCSD	Minimum Specifications for Traffic Control Signals and Devices
NAM	Negotiated Acceptance Memorandum
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NIST	National Institute for Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NSF	NSF International
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
DTPW	Miami-Dade County Department of Transportation and Public Works
SAE	Society of Automotive Engineers
SBE-CONST	Small Business Enterprise-Construction
SI	International System of Units
SSPC	Society of Protective Coatings
TSSQPL	Traffic Signals and Signs Qualified Products List
UL	Underwriters' Laboratories
U.S.C.	United States Code

D. Definitions

The following terms, when used in the Specifications, have the meaning described.

1. Article. The numbered prime subdivision of a Division of these Specifications.
2. Bracing. A temporary structural member(s) placed between beams, girders, piles columns, etc. to provide stability during construction activities.
3. Calendar day. Every day shown on the calendar, ending and beginning at midnight. Unless otherwise stipulated in the Contract Documents, the term “days” shall be understood as calendar days. In computing any period of time prescribed or allowed by this Contract, the day of the act, event, or default from which the designated period of time begins to run shall not be included. The last day of the period so computed shall be included unless it is a Saturday, Sunday, or legal holiday, in which event the period shall run until the end of the next day which is neither a Saturday, Sunday, or legal holiday. When the period of time prescribed or allowed is less than 7 days, intermediate Saturdays, Sundays, and legal holidays shall be excluded in the computation.
4. Construction Affecting Public Safety. Construction that may jeopardize public safety such as structures spanning functioning vehicular roadways, pedestrian walkways, railroads, navigation channels of navigable waterways and walls or other structure foundations located in embankments immediately adjacent to functioning roadways. It does not apply to those areas of the site under Contractor’s control and outside the limits of normal public access.
5. Contract. The term “Contract” means the entire and integrated agreement between the parties thereunder and supersedes all prior negotiations, representations, or agreements, either written or oral. The executed Contract Documents form the Contract between the Department (on behalf of the County) and Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the Work and the basis of payment.
6. Contract Documents. Consists of those items so designated in and inclusive of the executed Contract. Only printed or hard copies of the items listed in the executed Contract Form are Contract Documents.
7. Contract Time. The maximum number of calendar days, including authorized time extensions, allowed for final completion of all Contract work and requirements. Also called Contract Duration.
8. Contract Unit Price. Refers to the Unit Price provided by the Contract that is fixed at time of Contract award.
9. Contractor. The individual, firm, joint venture, or company contracting with the County to perform the Work pursuant to the Contract. Also referred to elsewhere in the Contract Documents as the Consultant, Systems Integrator, and their team.
10. Contractor’s Engineer of Record.
    a. A Professional Engineer registered in the State of Florida, other than the Engineer of Record or his subcontracted consultant, who undertakes the design and drawing of components of the permanent structure as part of a redesign, or for repair designs and details of the permanent work. Contractor’s Engineer of Record may also serve as the Specialty Engineer.
    b. Contractor’s Engineer of Record must be an employee of a pre-qualified firm. The firm shall be pre-qualified in accordance with the Rule 14-75, F.A.C. Any Corporation or Partnership offering engineering services must hold a Certificate of Authorization from the Florida Board of Professional Engineers.
    c. As an alternate to being an employee of a pre-qualified firm, Contractor’s Engineer of Record may be a pre-qualified Specialty Engineer. For items of the permanent Work declared by the FDOT Construction Office to be ”major” or “structural”, the work performed by a pre-qualified Specialty Engineer must be checked by another pre-qualified Specialty Engineer. An individual Engineer may become pre-qualified in the work groups listed in Rule 14-75, F.A.C., if the requirements for the Professional Engineer are met for the individual work groups. Pre-qualified Specialty Engineers are listed on the FDOT Construction Office website. Pre-qualified Specialty Engineers will not be authorized to perform redesigns of items fully detailed in the Plans.
11. Contractor Originated Designs. Items which the Contract Documents require Contractor to design, detail and incorporate into the permanent works.
12. Controlling Work Items. The activity or work item on the critical path having the least amount of total float. The controlling item of work will also be referred to as a Critical Activity.
13. Corridor. The beginning and ending limits of a street or roadway for which a series of consecutive traffic signals that are coordinated to allow for a reduced number of and frequency of required stops.
14. County. Miami-Dade County, Florida.
15. Department. Miami-Dade County Department of Transportation and Public Works.
16. Engineer. The County Engineer, acting directly or through duly authorized representatives; such representatives acting within the scope of the duties and authority assigned to them.
    a. Note: In order to avoid cumbersome and confusing repetition of expressions in these Specifications, it is provided that whenever anything is, or is to be done, if, as, or, when, or where “acceptable, accepted, approval, approved, authorized, condemned, considered necessary, contemplated, deemed necessary, designated, determined, directed, disapproved, established, given, indicated, insufficient, ordered, permitted, rejected, required, reserved, satisfactory, specified, sufficient, suitable, suspended, unacceptable, or unsatisfactory,” it shall be understood as if the expression were followed by the words “by Engineer,” “by the Engineer,” “to the Engineer,” or “of the Engineer.”

17. Engineer of Record. The Professional Engineer or Engineering Firm registered in the State of Florida that develops the criteria and concept for the project, performs the analysis, and is responsible for the preparation of the Plans and Specifications. The Engineer of Record may be Departmental in-house staff or a consultant retained by the Department. Contractor shall not employ the Engineer of Record as Contractor's Engineer of Record or as a Specialty Engineer.

18. Equipment. The machinery and equipment, together with the necessary supplies for upkeep and maintenance thereof, and all other tools and apparatus necessary for the construction and acceptable completion of the work.

19. Highway, Street, or Road. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

20. Holidays. Days designated by Miami-Dade County as holidays, which include, but are not limited to, New Year's Day, Martin Luther King's Birthday, President's Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and the following Friday, and Christmas Day.

21. Inspector. An authorized representative of the Engineer, assigned to make official inspections of the materials furnished and of the work performed by Contractor.

22. Laboratory. The official testing laboratory authorized by the Department.

23. Materials. Any substances to be incorporated in the work under the Contract.

24. Median. The portion of a divided highway or street separating the traveled ways for traffic moving in opposite directions.

25. Permanent Works. All the permanent structures and parts thereof required of the completed Contract.

26. Plans. The part of the Contract Documents prepared or approved by the Engineer, including reproductions thereof, which graphically shows or supplements the scope, extent, and character of the Work to be performed by Contractor. Whenever the word "Plans" appears in these Contract Documents, it shall include any related drawings or standard details referenced by the Contract Documents.

27. Proposal.

    a. Technical Proposal: The bidder's submittal in response to the technical requirements set forth in the Department's RFP.

    b. Price Proposal: The bidder's submittal, on the prescribed form, in response to the price requirements set forth in the Department's RFP.

28. Proposal Guaranty. The security furnished by the bidder as guaranty that the bidder will enter into the Contract for the work if the Department accepts the proposal.

29. Right-of-Way. The land that the Department has title to, or right of use, for the road and its structures and appurtenances, and for material pits furnished by the Department.

30. Roadbed. The portion of the roadway occupied by the subgrade and shoulders.

31. Roadway. The portion of a highway within the limits of construction.

32. Scaffolding. An elevated work platform used to support workmen, materials and equipment, but not intended to support the structure.

33. Section. A numbered prime division of these Specifications; or a subset of a corridor or grid in which a series of traffic signals are coordinated to provide uninterrupted flow for a platoon of vehicles.

34. Shop Drawings. All working, shop and erection drawings, associated trade literature, calculations, schedules, manuals and similar documents submitted by Contractor to define some portion of the Work. The Work may include both permanent and temporary works as appropriate to the Project. Shop Drawings and other contractor submittals are not Plans as so defined.

35. Special Provisions. Project specific clauses adopted by the Department that add to or revise these Specifications and associated supplemental specifications, or provide other requirements applicable to the Contract.

36. Specialty Engineer.

    a. A Professional Engineer registered in the State of Florida, other than the Engineer of Record or his subcontracted consultant, who undertakes the design and drawing preparation of components, systems, or installation methods and equipment for specific temporary portions of the Work or for special items of the permanent works not fully detailed in the plans and required to be furnished by Contractor such as but not limited to pot bearing designs, non-standard expansion joints, mechanically stabilized earth wall designs and other specialty items. The Specialty Engineer may also provide designs and details for items of the permanent work declared by the FDOT Construction Office to be "minor" or "non-structural". The Specialty Engineer may be an employee or officer of Contractor or a fabricator, an employee or officer of an entity providing components to a fabricator, or an independent consultant.

    b. For items of work not specifically covered by Rule 14-75, F.A.C., a Specialty Engineer is qualified if he has the following qualifications:

        1) Registration as a Professional Engineer in the State of Florida.

        2) The education and experience necessary to perform the submitted design as required by the Florida Board of Professional Engineers.

37. Specifications. The directions, provisions, and requirements contained herein, together with all stipulations contained in the Contract Documents, setting out or relating to the method and manner of

performing the work, or to the quantities and qualities of materials and labor to be furnished under the Contract.

38. State. State of Florida.

39. Structure. Any waterworks, drainage works, sewage works, river works, earthworks or constructions of any kind, including those of earth or rock, permanent or temporary, and including bridges, dam, wall, caisson, mast, tower, pylon, underground tank, earth retaining elements or assembly of elements, formwork, falsework, scaffold, fences, poles, buildings, pavings, inlets, levees, tide gates, spillways, drop structures, any structure similar to the foregoing, and any other form of building, construction, arrangement of parts, elements, or materials found in structures.

40. Subarticle. A prime subdivision of an Article of these Specifications.

41. Subgrade. The portion of the roadbed immediately below the base course or pavement, including below the curb and gutter, valley gutter, shoulder and driveway pavement. The subgrade limits ordinarily include those portions of the roadbed shown in the plans to be constructed to a design bearing value or to be otherwise specially treated. Where no limits are shown in the plans, the subgrade section extends to a depth of 12 inches below the bottom of the base or pavement and outward to 6 inches beyond the base, pavement, or curb and gutter.

42. Substructure. All of that part of a bridge structure below the bridge seats, including the parapets, backwalls, and wingwalls of abutments.

43. Superintendent. Contractor's authorized representative in responsible charge of the work.

44. Superstructure. The entire bridge structure above the substructure, including anchorage and anchor bolts, but excluding the parapets, backwalls, and wingwalls of abutments.

45. Surety. The corporate body that is bound by the Contract Bond with and for Contractor and responsible for the performance of the Contract and for payment of all legal debts pertaining thereto.

46. Temporary Works. Any temporary construction work necessary for the construction of the permanent works. This includes but is not limited to bracing, falsework, formwork, scaffolding, shoring, temporary earthworks, sheeting, cofferdams, and special erection equipment.

47. Traveled Way. The portion of the roadway providing for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

48. Traffic Control Signals and Devices. Any signal or device, manually, electrically or mechanically operated, by which traffic is alternately directed to stop and permitted to proceed or controlled in any manner. Traffic control signals and devices regulate, warn, or guide traffic on, over or adjacent to a street, highway, pedestrian facility, or bikeway by authority of a public agency having jurisdiction. Traffic control signals and devices include, but are not limited to, controller assemblies (controller cabinets and their contents); signal heads including their hanging or mounting devices; vehicle detection systems (loops, sealant, amplifier, lead-in wire, or cable); pedestrian detection systems (push button, push button housing, lead-in wires, and signal); motorist information systems, video equipment, network devices, dynamic message signs, highway advisory radios, cameras, vehicle detection systems, and other equipment used within a traffic control system.

49. Underground Facilities. All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. Work. All labor, materials and incidentals required to execute and complete the requirements of the Contract including superintendence, use of equipment and tools, and all services and responsibilities prescribed or implied.

51. Working Day. Any calendar day on which Contractor works or is expected to work in accordance with the approved work progress schedule.

1.02 ADDITIONAL REQUIREMENTS UNDER THE CONTRACT DOCUMENTS

A. Intent of Contract and Contract Documents

1. The intent of the Contract is to provide for the engineering services, furnishing of materials, construction, and completion in every detail of the work described in this Contract. The Contractor shall furnish all engineering and all of its associated direct and indirect costs, construction labor, materials, equipment, supervision, tools, transportation, and supplies required to complete the work in accordance with the requirements of the Contract Documents.

2. The Contractor shall have all liability and responsibility for all unknowns and/or differing site conditions; and including but not limited to any or all utilities, subsoil conditions, permits, etc. of any nature or kind, unless otherwise stated in the Contract.

B. Alteration of Plans or of Character of Work

1. Engineer reserves the right to make, at any time prior to or during the progress of the Work, such increases or decreases in quantities, whether a significant change or not, and such alterations in the details of construction, whether a substantial change or not, including but not limited to alterations in the grade or alignment of the road or structure or both, as may be found necessary or desirable by the Engineer. The term "significant change" applies only when the Engineer determines that the character of the work, as altered, differs materially from that involved or included in the original proposed construction.

2. Such increases, decreases or alterations shall not constitute a breach of Contract, shall not invalidate the Contract, nor release the Surety from any liability arising out of this Contract or the Surety bond. Contractor agrees to perform the work, as altered, the same as if it had been a part of the original Work.

3. The Department may require work that is not covered by a price in the Contract if the Department determines that such work does not constitute a significant change and is essential to the satisfactory completion of the Contract within its intended scope. If an adjustment in price is warranted, Engineer will determine the basis of payment for such an adjustment in a fair and equitable amount and authorize the adjustment through an executed Negotiated Acceptance Memorandum (NAM) provided by the Department.

4. In the instance of an alleged significant change, Engineer will review all pertinent information provided by Contractor to determine the validity of the allegation. The determination by Engineer shall be conclusive and shall not be subject to challenge by Contractor in any forum, except upon Contractor establishing by clear and convincing proof that the determination by Engineer was without any reasonable and good-faith basis.

C. Contractor Proposed Changes Affecting Utilities

1. Contractor is responsible for identifying and assessing any potential impacts to a utility that may be caused by the changes proposed by Contractor, and Contractor must, at the time of making the request for a change, notify the Department in writing of any such potential impacts to utilities.

2. Department approval of a Contractor proposed change does not relieve Contractor of sole responsibility for all utility impacts, costs, delays or damages, whether direct or indirect, resulting from Contractor initiated changes in the design or construction activities from those in the original Contract Specifications, design plans (including traffic control plans) or other Contract Documents and which effect a change in utility work different from that shown in the utility plans, joint project agreements or utility relocation schedules.

D. Rights in and Use of Materials Found on the Site of the Work

1. Ownership and Disposal of Existing Materials: Unless otherwise directed by Engineer or elsewhere in the Contract Documents, take ownership and dispose of all materials that are not designated as the property of other parties, in both roadway and structures, found on the right-of-way, and all material in structures designated for removal. Such materials do not include earth or other excavated material required for the construction of the Project. During construction, Contractor may use materials from existing structures that are required to be removed and that are designated to remain the property of the Department. Do not cut or otherwise damage such material during removal unless Engineer gives permission to do so. Store material in an accessible location as Engineer directs. The Department is not responsible for the quality or quantity of any material salvaged.

2. Ornamental Trees and Shrubs: Take ownership of all ornamental trees or shrubs existing in the right-of-way that are required to be removed for the construction operations and which are not specifically designated on the Plans to be reset, relocated, or to be removed by others prior to the construction operations.

E. Restoration of Property

1. Take preconstruction videos/pictures of the entire work zone and adjacent areas.

2. Public or private property damaged during construction or removed for convenience of the Work must be repaired or replaced at Contractor's expense in a manner acceptable to Engineer, prior to final acceptance of the Work or sooner if otherwise required by the Contract Documents or Engineer. This includes, but is, not limited to signalization equipment and miscellaneous hardware removed from the construction site, signs, driveways, landscaping, sidewalk, walkways, walls, fences, footings, underground utilities, etc.

3. Contractor must comply with the requirements of Miami-Dade County Code Section 2-103.1 (b), CONSTRUCTION OF PUBLIC UTILITIES OR WORKS IN PUBLIC RIGHTS-OF-WAY

   a. “Whenever any person, corporation, partnership, association, County Department or other legal entity performs any construction or public work within an existing right-of-way located within unincorporated Miami-Dade County, or in right-of-ways of roads or streets located within municipalities that are maintained by the County, the right-of-way, including sidewalks, curbs and gutters, landscaping and must be restored to their legally permissible preexisting condition, including any aesthetic enhancements thereto and any adjacent private property damaged during construction, within forty-five (45) days of completion of the construction or public work in that right of way or within forty-five (45) days of damage to the affected property or area, whichever occurs first. Prior to the time such construction work begins, the contractor, by posting the construction site, shall inform the local community of the requirement to restore the right-of-way as well as any affected adjacent private property and the fines that could be imposed for each failure to do so. All work to be done pursuant to this Section shall be performed in compliance with the Public Works Manual. Any entity failing to restore the right-of-way to its preexisting condition or better within the time permitted shall be subject to a civil fine of five hundred dollars ($500.00) per violation per day until such time as the right-of-way is restored, as well as five hundred dollars ($500.00) per day for

each affected adjacent private property until it is restored." Contractor may obtain a complete copy of the Ordinance from the Clerk of the Board.

b. Post the construction site pursuant to Miami-Dade County Code Section 2-103 (b). The Public Notice to be posted is to read as follows:

PUBLIC NOTICE
ORDINANCE NO. 03-89

Contractor shall restore the right-of-way as well as any affected adjacent private property within 45 days of completion of construction or damage to the affected property or area, whichever occurs first.

Any entity failing to restore the right-of-way to its pre-existing condition or better within the time promoted shall be subject to a civil fine of $500 per violation per day.

4. Survey monuments.

   a. Upon completion of construction activities and prior to the expiration of the Contract:

      1) Coordinate the replacement of any monument(s) disturbed or destroyed.

      2) Submit to Engineer for review and approval, a survey report that includes all monuments replaced and all monuments impacted as a result of construction activities.

   b. The replacement of monuments and the preparation of the survey report must be by a licensed Florida Surveyor and Mapper and meet all applicable State Rules, Statutes, and requirements of the Department. All costs required for compliance with these requirements will be included among the Contract pay items.

5. Failure to Restore Damaged Property:

   a. In case of failure on the part of Contractor to restore such property, bridge, road or street, or to make good such damage or injury, Engineer may, upon 48 hours notice, proceed to repair, rebuild, or otherwise restore such property, road, or street as may be deemed necessary, and the Department will deduct the cost thereof from any monies due or which may become due Contractor under the Contract. Nothing in this clause prevents the Contractor from receiving proper compensation for the removal, damage, or replacement of any public or private property, not shown on the plans, that is made necessary by alteration of grade or alignment. Engineer will authorize such work, provided that Contractor, or his employees or agents, have not, through their own fault, damaged such property.

F. Final Cleaning Up of Right-of-Way

1. Upon completion of the Work, and before the Department accepts the Work and makes final payment, remove from the right-of-way and adjacent property all falsework, equipment, surplus and discarded materials, rubbish and temporary structures; restore in an acceptable manner all property, both public and private, that has been damaged during the prosecution of the work; and leave the waterways unobstructed and the roadway in a neat and presentable condition throughout the entire length of the work under Contract. Clean all areas impacted by the Work and remove sedimentation in drainage structures caused by the construction activities.

2. Do not dispose of materials of any character, rubbish or equipment, on abutting property, with or without the consent of the property owners. Engineer will allow Contractor to temporarily store equipment, surplus materials, usable forms, etc., on a well-kept site owned or leased by Contractor, adjacent to the Project. However, do not place or store discarded equipment, materials, or rubbish on such a site.

3. Shape, dress and restore areas adjacent to the Project right-of-way that were used as plant sites, materials storage areas or equipment yards when they are no longer needed for such purposes.

1.03 CONTROLLING WORK

A. Plans

1. Contract Documents: Have one complete copy of the Contract Documents available on the worksite at all times.

2. Department’s Plans: Unless otherwise labeled, all Items shown on the Plans are considered to be part of the Work, and must be incorporated into the Work and included in the established prices.

3. Alterations in Plans: The Department will issue, in writing, all authorized alterations affecting the requirements and information given on the approved plans.

B. Typical Details and/or Sketches

1. Typical details and/or sketches regarding the proposed work may be provided in addition to the standard details that are available in the Miami-Dade County Public Works Manual and the latest edition of the Florida Department of Transportation's Design Standards for Design, Construction, Maintenance and Utility Operations on The State Highway System.

2. County through its Engineer shall have the right to modify the details and/or sketches, to supplement the sketches with additional plans and/or with additional information as work proceeds; all of which shall be considered as plans accompanying these Specifications herein generally referred to as the "Plans.” In case of disagreement between the Plans and Specifications, Engineer will make a final determination as to which will govern.

C. Shop Drawings

1. Shop Drawings:

a. General. Prepare and submit whatever detailed working drawings necessary to fabricate, erect, and construct all parts of the Work in conformity with the Plans and Specifications. Shop drawings shall be submitted to Engineer; two sets will be returned to Contractor approved or showing the changes or corrections required; if changes or corrections are required, four revised copies shall be resubmitted until they are approved. Payment for shop drawings and required documents, revisions thereof, and for all copies furnished, shall be included in the various items of work bid. Contractor should allow a minimum of 14 days for the County's approval of shop drawings. County is not responsible for errors or minor discrepancies of Contractor's drawings, even though approved.

b. Work Items Requiring Shop Drawings: In general, the Department requires shop drawings for items of work not fully detailed in the plans which require additional drawings and coordination prior to constructing the item, including but not limited to:

1) Bridge components not fully detailed in the plans

2) Retaining Wall Systems

3) Precast Box Culverts

4) Non-standard lighting, signalization and signing structures and components

5) Building structures

6) Drainage structures, attenuators, and other nonstructural items

7) Design and structural details furnished by Contractor in compliance with the Contract

8) Temporary Works affecting public safety.

c. Schedule of Submittals: Prepare and submit a schedule of submittals that identifies the work for which shop drawings apply. For each planned submittal, define the type, and approximate number of drawings or other documents that are included and the planned submittal date, considering the processing requirements herein. Submit the schedule of submittals to Engineer at the preconstruction conference, and prior to the submission of any shop drawings. Coordinate subsequent submittals with construction schedules to allow sufficient time for review, approval, and re-submittal as necessary.

d. Style, Numbering, and Material of Submittals:

1) Drawings: Furnish four clearly legible copies of all shop drawings that are necessary to complete the structure in compliance with the design shown on the Plans. Prepare all shop drawings using the same units of measure as those used in the Plans. Use sheets no larger than 11 by 17 inches unless otherwise required by Engineer. Consecutively number each sheet in the submittal series, and indicate the total number in the series (i.e., 1 of 12, 2 of 12, . . ., 12 of 12). Include on each sheet the following items as a minimum requirement: the Project Number, Bridge Number(s), drawing title and number, a title block showing the names of the fabricator or producer and Contractor for which the work is being done, the initials of the person(s) responsible for the drawing, the date on which the drawing was prepared, the location of the item(s) within the Project, Contractor’s approval stamp with date and initials, and, when applicable, the documents shall be signed and sealed by the Specialty Engineer or Contractor’s Engineer of Record, as appropriate. A re-submittal will be requested when any of the required information is not included.

2) Other Documents: Provide four sets of original documents or clearly legible copies of documents other than drawings, such as trade literature, catalogue information, calculations, and manuals. Provide sheets no larger than 11 by 17 inches unless otherwise required by Engineer. Clearly label and number each sheet in the submittal to indicate the total number of sheets in the series (i.e., 1 of 12, 2 of 12, . . ., 12 of 12). Additional sets of documentation may be required by Engineer for review of precast prestressed and structural steel components.

3) Prepare all documents using the same units of measure as those used in the Contract Documents. Bind and submit all documents with a Table of Contents cover sheet. List on the cover sheet the total number of pages and appendices, and include the Project Number, a title referencing the submittal item(s), the name of the firm and person(s) responsible for the preparation of the document, Contractor’s approval stamp with date and initials, and, when applicable, the documents shall be signed and sealed by the Specialty Engineer or Contractor’s Engineer of Record, as appropriate.

4) Submit appropriately prepared and checked calculations and manuals that clearly outline the design criteria. Include on the internal sheets the Project Number and the initials of the person(s) responsible for preparing and checking the document.

5) Clearly label trade literature and catalogue information on the front cover with the title, Project Number, date and name of the firm and person(s) responsible for that document.

e. Submittal Paths and Copies:

1) General: Submit shop drawings to Engineer or Engineer's duly authorized representative. At the preconstruction conference, the Department will notify Contractor of any changes in the submittal path and whether the Department's or the Consultant's review stamp will signify an officially reviewed shop drawing. When the Engineer of Record is a consultant hired by the Department, submit shop drawings to the consultant with a copy to Engineer. For work requiring other documentation (e.g., catalog data, procedure manuals, fabrication/welding procedures, and maintenance and operating manuals), submit the required number of copies with the prints. If not shown on the plans, the Department will furnish the mailing address of the Consulting Engineer of Record. Provide copies of material certifications and material tests to Engineer.

2) Contractor-Originated Design: Submit shop drawings and applicable calculations to the Engineer of Record for review. Ensure that each sheet of the shop drawings and the cover sheet of the calculations are signed and sealed by the Specialty Engineer or Contractor's Engineer of Record. Transmit the submittal and copies of the transmittal letters in accordance with the submittal requirements stipulated herein.

3) Other Miscellaneous Design and Structural Details Furnished by Contractor in Compliance with the Contract: Submit to Engineer any shop drawings and applicable calculations. Ensure that each sheet of the shop drawings and the cover sheet of the applicable calculations is signed and sealed by the Specialty Engineer. Transmit the submittal and copies of the transmittal letters in accordance with the submittal requirements stipulated herein.

f. Processing of Shop Drawings:

1) Contractor Responsibility for Accuracy and Coordination of Shop Drawings:

a) Coordinate, schedule, and control all submittals, with a regard for the required priority, including those of the various subcontractors, suppliers, and engineers, to provide for an orderly and balanced distribution of the work.

b) Submit shop drawings to facilitate expeditious review. Contractor is discouraged from transmitting voluminous submittals of shop drawings at one time. For submittals transmitted in this manner, allow for the additional review time that may result.

c) Only shop drawings distributed that have been approved by the Department are valid. Any work that Contractor performs in advance of approval will be at Contractor's risk.

2) Scope of Review by Engineer: The Engineer of Record's review of the shop drawings is for conformity to the requirements of the Contract Documents and to the intent of the design. The Engineer of Record's review of shop drawings which include means, methods, techniques, sequences, and construction procedures are limited to the effects on the permanent works. The Engineer of Record's review of submittals which include means, methods, techniques, sequences, and construction procedures does not include an in-depth check for the ability to perform the work in a safe or efficient manner. Review by the Engineer of Record does not relieve Contractor of responsibility for dimensional accuracy to ensure field fit and for conformity of the various components and details.

3) Special Review by Engineer of Shop Drawings for Construction Affecting Public Safety: For Construction Affecting Public Safety, the Engineer of Record, or other Engineer as the Department appoints for this purpose, will make an independent review of all relevant shop drawings and similar documents. Do not proceed with construction of the permanent works until receiving the Engineer of Record's approval. The review of these shop drawings is for overall structural adequacy of the item to support the imposed loads and does not include a check for economy, efficiency or ease of construction.

g. Cost of Shop Drawings: Include the cost of furnishing shop and working drawings in the Contract prices for the work requiring the shop and working drawings. The Department will not pay Contractor additional compensation for such drawings.

2. Corrections for Construction Errors:

a. For work that Contractor constructs incorrectly or does not meet the requirements of the Contract Documents, Contractor has the prerogative to submit an acceptance proposal to Engineer for review and disposition. The acceptance proposal shall describe the error or defect and either describe remedial action for its correction or propose a method for its acceptance. In either case, the acceptance proposal shall address structural integrity, aesthetics, maintainability, and the effect on Contract Time. The Department will judge any such proposal for its effect on these criteria and also for its effect on Contract Administration.

b. When Engineer judges that a proposal infringes on the structural integrity or maintainability of the structure, Contractor's Engineer of Record will perform a technical assessment and submit it to Engineer for approval.

c. Do not take any corrective action without Engineer's approval. Carry out all approved corrective construction measures at no expense to the County.

d. Notwithstanding any disposition of the compensation aspects of the defective work, Engineer's decision on the technical merits of a proposal is final.

D. Coordination of Contract Documents

1. These Specifications, the Plans, Special Provisions, and all supplementary documents are integral parts of the Contract; a requirement occurring in one is as binding as though occurring in all.

2. All parts of the Contract Documents are complementary and describe and provide for a complete work. In addition to the work and materials specified in the Specifications as being included in any specific pay item, include in such pay items additional, incidental work, not specifically mentioned, when so shown in the plans, or if indicated, or obvious and apparent, as being necessary for the proper completion of the work under such pay item and not stipulated as being covered under other pay items.

3. Promptly notify Engineer in writing of any conflict, error, ambiguity, omission or discrepancy which Contractor may discover within the Contract Documents and obtain a written interpretation or clarification from Engineer before proceeding with any work affected thereby. The higher quality, greater quantity, more specific or restrictive, or more expensive requirement necessary and applicable to the completed Project, based on Engineer's interpretation, will take precedence. Engineer's written decision on the issue will be final and binding.

E. Conformity of Work with Contract Documents

1. Perform all work and furnish all materials in conformity with the lines, grades, cross-sections, dimensions, and material requirements, including tolerances, as specified in the Contract Documents.

2. In the event that Engineer finds that Contractor has used material or produced a finished product that is not in conformity with the Contract Documents, but that Contractor has produced reasonably acceptable work, Engineer will determine if the Department will accept the work. In this event, Engineer will document the basis of acceptance by Contract modification, which provides for an appropriate reduction in the Contract price for such work or materials included in the accepted work as deemed necessary to conform to the determination based on engineering judgment.

3. In the event that Engineer finds that Contractor has used material or produced a finished product that is not in conformity with the Contract Documents, and that Contractor has produced an inferior or unsatisfactory product, Contractor shall remove and replace or otherwise correct the work or materials at no expense to the County.

4. For base and surface courses, the Department will allow the finished grade to vary as much as 0.1 foot from the grade shown in the plans, provided that Contractor's work meets all templates and straightedge requirements and contains suitable transitions.

F. Errors or Omissions in Contract Documents

1. Do not take advantage of any apparent error or omission discovered in the Contract Documents, but immediately notify Engineer of such discovery. Engineer will then make such corrections and interpretations as necessary to reflect the actual spirit and intent of the Contract Documents.

G. Authority of Engineer

1. Perform all work to the satisfaction of Engineer. Engineer will decide all questions, difficulties, and disputes, of whatever nature, that may arise relative to the interpretation of the Plans, construction, prosecution, and fulfillment of the Contract, and as to the character, quality, amount, and value of any work done, and materials furnished, under or by reason of the Contract.

H. Authority and Duties of Engineer's Assistants

1. Engineer's assistants and representatives are authorized to inspect all work done and all materials furnished. Such inspection may extend to all or any part of the work and to the manufacture, preparation, or fabrication of the materials to be used. Such assistants and representatives are not authorized to revoke, alter, or waive any requirement of these Specifications. Rather, they are authorized to call to the attention of Contractor any failure of the work or materials to meet the Contract Documents, and have the authority to reject materials or suspend the work until any questions at issue can be referred to and decided by Engineer.

2. Engineer will immediately notify Contractor in writing of any such suspension of the work, stating in detail the reasons for the suspension. The presence of the inspector or other assistant in no way lessens the responsibility of Contractor.

I. Contractor's Supervision

1. Contractor's Superintendent:

a. Maintain a competent superintendent at the Site at all times while work is in progress to act as Contractor's agent. The superintendant must:

1) Be capable of properly interpreting the Contract Documents and thoroughly experienced in the type of work being performed.

2) Have full authority to receive instructions from Engineer and to execute the orders or directions of the Engineer, including promptly supplying any materials, tools, equipment, labor, and incidentals that may be required.

3) Speak and understand English.

b. Maintain at least one other responsible person who speaks and understands English, on the Project during all working hours.

c. Furnish sufficient superintendence and supervisory personnel commensurate to the amount and type of work being performed.

2. Supervision for Emergencies:

a. Provide a responsible person, who speaks and understands English, and who is available at or reasonably near the worksite on a 24 hour basis, seven days a week. Designate this person as the point of contact for emergencies and in cases that require immediate action to maintain traffic or to resolve any other problem that might arise.

b. Submit, by certified mail, the phone numbers and names of personnel designated to be contacted in cases of emergencies, along with a description of the project location, to the Miami-Dade Police and all other local law enforcement agencies.

J. General Inspection Requirements

1. Cooperation by Contractor:

a. Notify Engineer daily where each of his crews will be working and what work will be done. This notification shall be given each weekday between 3:00 p.m. and 4:00 p.m. on the prior day.

b. Do not perform work or furnish materials without obtaining inspection by Engineer or his representative. Furnish Engineer with every reasonable facility for ascertaining whether the work performed and materials used are in accordance with the requirements and intent of the Contract Documents.

c. If Engineer so requests at any time before final acceptance of the work, remove or uncover such portions of the finished work as directed. After examination, restore the uncovered portions of the work to the standard required by the Contract Documents. If Engineer determines that the work so exposed or examined is unacceptable, perform the uncovering or removal, and the replacing of the covering or making good of the parts removed, at no expense to the County. However, if Engineer determines that the work thus exposed or examined is acceptable, the County will pay for the uncovering or removing, and the replacing of the covering or making good of the parts removed in accordance with the terms of the Contract Documents.

2. Failure of Engineer to Reject Work During Construction: If, during or prior to construction operations, Engineer fails to reject defective work or materials, whether from lack of discovery of such defect or for any other reason, such initial failure to reject in no way prevents the later rejection when such defect is discovered, or obligates the County to final acceptance. The County is not responsible for losses suffered due to any necessary removals or repairs of such defects.

3. Failure to Remove and Renew Defective Materials and Work: If Contractor fails or refuses to remove and renew any defective materials used or work performed, or to make any necessary repairs in an acceptable manner and in accordance with the requirements of the Contract within the time indicated in writing, the Engineer has the authority to repair, remove, or renew the unacceptable or defective materials or work as necessary, all at Contractor's expense. The Department will obtain payment for any expense it incurs in making these repairs, removals, or renewals, that Contractor fails or refuses to make, by deducting such expenses from any moneys due or which may become due Contractor, or by charging such amounts against the Contract bond.

4. Inspection by State and/or Federal Government: When the State of Florida and/or the United States Government pays a portion of the cost of construction, their representatives may inspect the construction work as they deem necessary. However, such inspection(s) will in no way make the State or the Federal Government a party to the Contract.

K. Final Inspection

1. Maintenance until Acceptance: Maintain all Work until Engineer has given final acceptance in accordance with the requirements of the Contract Documents.

2. Inspection for Acceptance:

a. Upon notification that all Contract Work, or all Contract Work on the portion of the Contract scheduled for acceptance, has been completed, Engineer will make an inspection for acceptance. The inspection will be made within seven days of the notification. If Engineer finds that all work has been satisfactorily completed, the Department will consider such inspection as the final inspection. If any or all of the Work is found to be unsatisfactory, Engineer will detail the remedial work required to achieve acceptance. Immediately perform such remedial work. Subsequent inspections will be made on the remedial work until Engineer accepts all Work.

b. Upon satisfactory completion of the Work, the Department will provide written notice of acceptance, either partial or final, to Contractor.

c. Until final acceptance in accordance with the requirements of the Contract Documents, replace or repair any damage to the accepted Work.

3. Partial Acceptance: At Engineer's sole discretion, Engineer may accept any portion of the Work under the provisions stipulated above.

4. Conditional Acceptance: Engineer will not make, or consider requests for conditional acceptance of a project.

L. Final Acceptance.

a. When, upon completion of the final construction inspection of the entire Project, Engineer determines that Contractor has satisfactorily completed all the Work and furnished all documents required by the Contract Documents, Engineer will give Contractor written notice of final acceptance. Final Acceptance shall also denote the beginning of any warranty periods associated with the Project.

1.04 CONTROLLING MATERIALS

A. Acceptance Criteria

1. General:

a. All materials and equipment, except for materials specifically called for on the Contract Documents to be provided by the County, are to be supplied by the Contractor who must, as required, obtain shop drawing approvals and order these items in a timely fashion so as not to cause any delays in the approved schedule.

b. Acceptance of materials is based on the criteria provided herein and elsewhere in the Contract Documents. All requirements may not apply to all materials. Use only materials in the Work that meet the requirements of the Contract Documents. Engineer may inspect and test any material, at points of production, distribution and use.

2. Sampling and Testing:

a. Use sample identification and tracking forms approved by Engineer to provide related information and attach the information to each sample. Restore immediately any site from which material has been removed for sampling purposes to the pre-sampled condition with materials and construction methods used in the initial construction, at no additional cost to the County. Ensure that sufficient material is delivered to allow for proper sample collection, at no expense to the County.

b. Where required:

1) Pretest by Manufacturers: Submit certified manufacturer's test results to Engineer for qualification and use on the Project. Testing will be as specified in the Contract Documents. The Department may require submittal from manufacturers of samples of materials for independent verification purposes.

2) Point of Production Test: Test the material during production as specified in the Contract Documents.

3) Point of Distribution Test: Test the material at Distribution facilities as specified in the Contract Documents.

4) Point of Use Test: Test the material immediately following placement as specified in the Contract Documents. After delivery to the Project, the Department may require the retesting of materials that have been tested and accepted at the source of supply, or may require the testing of materials that are to be accepted by Producer Certification. The Department may reject all materials that, when retested, do not meet the requirements of the Contract Documents.

3. Certification:

a. Manufacturer Material Certification: Submit material certifications for all materials to Engineer for approval when required by the Specifications. Materials will not be considered for payment when not accompanied by a material certification. Sample material certification forms are available on the FDOT's website at the following URL: http://www.fdot.gov/materials/navigation/documents.shtm

b. Ensure that the material certification follows the format of the sample form, is submitted on the manufacturer's letterhead and is signed by a legally responsible person employed by the manufacturer.

c. FDOT Approved Product List (APL): The Department will limit Contractor's use of products and materials that require use of APL items to those listed on the APL effective at the time of placement.

d. Traffic Signals and Signs (TSS) Division's Qualified Products List (TSSQPL):

1) Only those traffic control equipment and materials listed in the DTPW Traffic Signals and Signs (TSS) Division's Qualified Products List (TSSQPL), or submitted to and approved in writing by the DTPW TSS for addition to the TSSQPL, are allowed to be installed within Miami-Dade County. Equipment or material used in the performance of the Work, without prior Departmental approval, must be replaced with Department approved equipment or material, at no cost to the County. The TSSQPL is available at http://www.miamidade.gov/qpl/Home.aspx

e. Contractor Installation Certification: Provide installation certifications as required by the Contract Documents.

B. Applicable Documented Authorities Other Than Specifications

1. General: Details on individual materials are identified in various material specific Sections of the Specifications that may refer to other documented

authorities for requirements. When specified, meet the requirements as defined in such references.

2. Test Methods: Methods of sampling and testing materials are in accordance with the Florida Methods (FM). If a Florida Method does not exist for a particular test, perform the testing in accordance with the method specified in the Specification. When test methods or other standards are referenced in the Specifications without identification of the specific time of issuance, use the most current issuance, including interims or addendums thereto, at the time of bid opening.
3. Construction Aggregates:
   a. Unless otherwise specified in the Contract Documents:
      1) All aggregate products and sources used in performance of the Work must be approved by FDOT pursuant to Rule 14-103, F.A.C. Aggregates and sources used must be identified in the FDOT "Approved Aggregate Products from Mines or Terminals" listings current at the time the aggregate is proposed for use on the Project.
      2) Each truck aggregate load ticket provided must include the DTPW Project Name and Number, name of the aggregate source, the FDOT Source Number, quantity, aggregate description and corresponding FDOT material code, producer ticket number, and statement "CERTIFIED FOR FDOT" or "CERT. FOR FDOT."

C. Storage of Materials and Samples

1. Method of Storage: Store materials in such a manner as to preserve their quality and fitness for the work, to facilitate prompt inspection, and to minimize noise impacts on sensitive receivers. More detailed requirements concerning the storage of specific materials are prescribed under the applicable Specifications. The Department may reject improperly stored materials.
2. Use of Right-of-Way for Storage: Unless otherwise stated in the Contract Documents, no Project staging areas have been provided by the County. If Engineer allows, Contractor may use a portion of the right-of-way for temporary storage purposes and for temporarily placing Contractor's plant and equipment. Use only the portion of the right-of-way that is outside the clear zone, which is the portion not required for public vehicular or pedestrian travel. When used, restore the right-of-way to pre-construction condition at no additional cost to the County or as specified in the Contract Documents. Provide any additional space required at no expense to the County.
3. Responsibility for Stored Materials: Accept responsibility for the protection of stored materials. The Department is not liable for any loss of materials, by theft or otherwise, or for any damage to the stored materials.
4. Storage Facilities for Samples: Provide facilities for storage of samples as described in the Contract Documents and warranted by the test methods and Specifications.

D. Defective Materials

1. Materials not meeting the requirements of the Contract Documents will be considered defective. Engineer will reject all such materials, whether in place or not. Remove all rejected material immediately from the site of the work and from storage areas, at no expense to the County.
2. Do not use material that has been rejected and the defects corrected, until Engineer has approved the material's use. Upon failure to comply promptly with any order of Engineer made under these provisions, Engineer will remove and replace defective material and deduct the cost of removal and replacement from any moneys due or to become due to Contractor.
3. As an exception to the above, Contractor may submit, upon approval of Engineer, an engineering and/or laboratory analysis to evaluate the effect of defective in-place materials. A Specialty Engineer, who is an independent consultant or Contractor's Engineer of Record as stated within each individual Section shall perform any such analysis. Engineer will determine the final disposition of the material after review of the information submitted by Contractor. No additional monetary compensation or time extension will be granted for the impact of any such analysis or review.

E. Products and Source of Supply

1. Source of Supply–Convict Labor (Federal-Aid Contracts Only):
   a. Do not use materials that were produced after July 1, 1991, by convict labor for Federal-aid highway construction projects unless the prison facility has been producing convict-made materials for Federal-aid highway construction projects before July 1, 1987.
   b. Use materials that were produced prior to July 2, 1991, by convicts on Federal-aid highway construction projects free from the restrictions placed on the use of these materials by 23 U.S.C. 114. The Department will limit the use of materials produced by convict labor for use in Federal-aid highway construction projects to:
      1) Materials produced by convicts on parole, supervised release, or probation from a prison or,
      2) Materials produced in a qualified prison facility.
   c. The amount of such materials produced for Federal-aid highway construction during any 12-month period shall not exceed the amount produced in such facility for use in such construction during the 12-month period ending July 1, 1987.
2. Source of Supply-Steel (Federal-Aid Contracts Only):

a. For Federal-aid Contracts, only use steel and iron produced in the United States, in accordance with the Buy America provisions of 23 CFR 635.410, as amended. Ensure that all manufacturing processes for this material occur in the United States. As used in this specification, a manufacturing process is any process that modifies the chemical content, physical shape or size, or final finish of a product, beginning with the initial melding and mixing and continuing through the bending and coating stages. A manufactured steel or iron product is complete only when all grinding, drilling, welding, finishing and coating have been completed. If a domestic product is taken outside the United States for any process, it becomes foreign source material. When using steel and iron as a component of any manufactured product incorporated into the project (e.g., concrete pipe, prestressed beams, corrugated steel pipe, etc.), these same provisions apply, except that the manufacturer may use minimal quantities of foreign steel and iron when the cost of such foreign materials does not exceed 0.1% of the total Contract amount or $2,500, whichever is greater.

b. These requirements are applicable to all steel and iron materials incorporated into the finished work, but are not applicable to steel and iron items that Contractor uses but does not incorporate into the finished work. Provide a certification from the producer of steel or iron, or any product containing steel or iron as a component, stating that all steel or iron furnished or incorporated into the furnished product was manufactured in the United States in accordance with the requirements of this specification and the Buy America provisions of 23 CFR 635.410, as amended. Such certification shall also include (1) a statement that the product was produced entirely within the United States, or (2) a statement that the product was produced within the United States except for minimal quantities of foreign steel and iron valued at $ (actual value). Furnish each such certification to Engineer prior to incorporating the material into the project. When FHWA allows the use of foreign steel on a project, furnish invoices to document the cost of such material, and obtain Engineer's written approval prior to incorporating the material into the project.

3. Unfit, Hazardous, and Dangerous Materials:

a. Do not use any material that, after approval and/or placement, has in any way become unfit for use.

b. Do not use materials containing any substance that has been determined to be hazardous by the State of Florida Department of Environmental Protection or the U.S. Environmental Protection Agency (EPA). Provide workplaces free from serious recognized hazards and to comply with occupational safety and health standards, as determined by the U.S. Department of Labor Occupational Safety and Health Administration (OSHA).

1.05 LEGAL REQUIREMENTS AND RESPONSIBILITY TO THE PUBLIC

A. Disaster Preparedness

1. General:

a. During periods in which any portion of Miami-Dade County is designated by the National Oceanic and Atmospheric Administration's National Hurricane Center as being under a Tropical Storm Watch or greater, Contractor shall perform all precautions as necessary to safeguard the Work and property, including the removal of all small equipment and materials from the site, securing all other equipment and materials to each other and to rigid construction, and any other safety measures as may be directed by Engineer.

2. Upon Notification of a Tropical Storm or Hurricane Watch:

a. Engineer will provide formal notification to Contractor to prepare and submit for approval a Plan of Action for the specific actions to be taken on their particular projects.

3. Upon Notification of a Tropical Storm or Hurricane Warning:

a. Engineer will provide formal notification to Contractor to implement the approved Plan of Action to protect the Project and the public.

b. For construction projects within the public right-of-way, Contractor will be notified by Engineer to suspend his construction operations. Contractor will backfill all open trenches, remove all construction equipment and materials from the right-of-way, remove unnecessary traffic barricades and signs, and secure remaining barricades by "half burial" or "double sand bags."

4. Storm or Disaster Services:

a. Contractor, by accepting the award of this Contract, recognizes and agrees that should a storm or other severe and catastrophic natural disaster affect the Miami-Dade-County area during the performance of the work, Contractor shall provide services contracted for during the contract period, at the Contract unit prices and at the same or different locations from those covered by this Contract.

b. For emergency services and conditions not addressed by this Contract, Contractor agrees to negotiate reasonable prices and terms with the County for any disaster-relief work required by the County. In all instances, Contractor agrees to negotiate reasonable time extensions for performance of disaster-relief work.

B. Laws to be Observed

1. General:

   a. Become familiar with and comply with all applicable Federal, State, County, and city laws, by-laws, ordinances, and regulations that control the action or operation of those engaged or employed in the Work or that affect materials used. Pay particular attention to the applicable safety regulations promulgated by the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). In addition, comply with Chapter 403, F.S. (Florida Statutes), regarding control of air pollution. Direct special attention to that portion of Chapter 17-5, F.A.C. (Florida Administrative Code), pertaining to open burning in land clearing operations. Where work or structures included in the Contract are in "Navigable Waters of the U.S.," (reference 33 of the Code of Federal Regulations, Part 329); "Waters of the U.S.," (reference 33 of the Code of Federal Regulations, Parts 323 and 328); or "Waters of the State," (reference Part 4, Chapters 253 and 373 of the Florida Statutes and Section 62-340, F.A.C.); comply with the regulatory provisions of Section 404 of the Federal Clean Water Act of 1977; Sections 9 and 10 of the Federal River and Harbor Act of 1899; Chapter 161, F.S.; and any local authority having jurisdiction over such waters.

   b. Obtain certification from the Construction Industry Licensing Board as required by Part I, Chapter 489, F.S., regardless of exemptions allowed by Section 489.103, F.S., prior to removing underground pollutant storage tanks. Dispose of tanks and pollutants in accordance with the requirements and regulations of any Federal, State, or local, agency having jurisdiction.

   c. Prior to building construction or renovation, provide copies of current registrations or certifications issued by the Florida Construction Industry Licensing Board in accordance with Chapter 489, F.S. for the appropriate category of construction.

   d. Corporations must be registered with the State of Florida, Department of State, Division of Corporations, and hold a current State Corporate Charter Number in accordance with Chapter 607, F.S.

   e. Contractor or the authorized subcontractor applying any roofing material must be licensed or be an approved dealer and applicator of the proposed roofing material.

   f. Indemnify, defend, and save harmless the County and all of its officers, agents, and employees, in the amount of the Contract price, against all claims or liability arising from or based on the violation of any such laws, by-laws, ordinances, regulations, order, or decrees; whether by himself or his employees.

2. Plant Quarantine Regulations: The U.S. Department of Agriculture and the Florida Department of Agriculture and Consumer Services have issued quarantine regulations pertaining to control of the nematodes of citrus, Rule 5B-44, Florida Administrative Code, and other plant pests. Contact the local (or other available) representatives of the Animal and Plant Health Inspection Service of the U.S. Department of Agriculture, and the Division of Plant Industry of the Florida Department of Agriculture and Consumer Services to ascertain all current restrictions regarding plant pests that are imposed by these agencies. Keep advised of current quarantine boundary lines throughout the construction period.

   a. These restrictions may affect operations in connection with such items as clearing and grubbing, earthwork, grassing and mulching, sodding, landscaping, and other items which might involve the movement of materials containing plant pests across quarantine lines.

   b. Obtain quarantine regulations and related information from the following:

   Animal and Plant Health Inspection Service
   U.S. Department of Agriculture
   3029 Lake Alfred Road
   Winter Haven, Florida 33881

   Director, Division of Plant Industry
   Florida Department of Agriculture and Consumer Services
   Post Office Box 147100
   Gainesville, Florida 32614-7100

3. Introduction or Release of Prohibited Aquatic Plants, Plant Pests, or Noxious Weeds:

   a. Do not introduce or release prohibited aquatic plants, plant pests, or noxious weeds into the project limits as a result of clearing and grubbing, earthwork, grassing and mulching, sodding, landscaping, or other such activities. Immediately notify Engineer upon discovery of all prohibited aquatic plants, plant pests, or noxious weeds within the project limits. Do not move prohibited aquatic plants, plant pests, or noxious weeds within the project limits or to locations outside of the project limits without Engineer's permission. Maintain all borrow material brought onto the project site free of prohibited aquatic plants, plant pests, noxious weeds, and their reproductive parts. Refer to Rule 16C-52 and Rule 5B-57, F.A.C. for the definition of prohibited aquatic plants, plant pests, and noxious weeds.

   b. Furnish Engineer, prior to incorporation into the Project, with a certification from the Florida Department of Agriculture and Consumer Services, Division of Plant Industry, stating that the sod, hay, straw, and mulch materials are free of noxious weeds, including Tropical Soda Apple.

4. Compliance with Federal Endangered Species Act and other Wildlife Regulations:

   a. In cases where protected, threatened or endangered species may unexpectedly be found or appear within close proximity to the project boundaries, the FDOT has established guidelines that will apply when interaction with certain species occurs, absent of any special

mitigation measures or permit conditions otherwise identified for the project. These guidelines are posted at the following URL address: www2.dot.state.fl.us/specificationsestimates/federal/endangeredwildlifeguidelines.pdf. Take responsibility to obtain this information and take all actions and precautions necessary to comply with the conditions of these guidelines and Federal regulations during all Project activities.

b. In the event of a potential impact to a protected, threatened or endangered species and mitigation measures or permits are necessary, coordinate with the appropriate resource agencies for clearance, obtain permits and perform mitigation measures as necessary. Immediately notify Engineer in writing of the results of this coordination with the appropriate resource agencies. Additional compensation or time will not be allowed for permitting or mitigation, associated with Contractor initiated off-project activities.

5. Occupational Safety and Health Requirements: Contractor shall take all precautions necessary for the protection of life, health, and general occupational welfare of all persons, including employees of both Contractor and the County, until Contractor has completed the work required under the Contract. Comply at all times with applicable Federal, State, and local laws, provisions, and policies governing safety and health, including 29 CFR 1926, including all subsequent revisions and updates.

6. Discovery of an Unmarked Human Burial: When an unmarked human burial is discovered, immediately cease all activity that may disturb the unmarked human burial and notify Engineer. Do not resume activity until specifically authorized by Engineer.

7. Insecticides and Herbicides: Use products approved by the Florida Department of Agriculture for the State of Florida, found on the following website http://state.ceris.purdue.edu/. The use of restricted products is prohibited. Do not use any products in the sulfonylurea family of chemicals. Herbicide application by broadcast spraying is not allowed.

   a. Procure any necessary licenses, pay all charges and fees, and give all notices necessary for lawful performance of the work.

   b. Ensure that all employees applying insecticides and herbicides possess a current Florida Department of Agriculture Commercial Applicator license with the categories of licensure in Right-of-Way Pest Control and Aquatic Pest Control. Provide a copy of current certificates upon request, to Engineer.

   c. Ensure that employees who work with herbicides comply with all applicable Federal, State, and local regulations.

   d. Comply with all regulations and permits issued by any regulatory agency within whose jurisdiction work is being performed. Post all permit placards in a protected, conspicuous location at the work site.

   e. Acquire any permits required for work performed on the rights-of-way within the jurisdiction of National Forests in Florida. Contact the Local National Forest Ranger District, or the United States Department of Agriculture (USDA) office for the proper permits and subsequent approval.

   f. Acquire all permits required for aquatic plant control as outlined in Chapter 62C-20, F.A.C., Rules of the Florida Department of Environmental Protection. Contact the Regional Field Office of Bureau of Invasive Plant Management of the Florida Department of Environmental Protection for proper permits and subsequent approval. If application of synthetic organo-auxin herbicides is necessary, meet the requirements of Chapter 5E-2, F.A.C.

8. Employment Eligibility Verification

   a. By entering into this Contract, the Contractor affirms its enrollment and participation in the Federal work authorization program known as “E-Verify”, web address https://e-verify.uscis.gov/enroll operated by the United States Citizenship and Immigration Services Bureau of the United States Department of Homeland Security, to verify information under the terms governing use of the system.

   b. The Contractor shall utilize the U.S. Department of Homeland Security's E-Verify system, in accordance with the terms governing use of the system, to confirm the employment eligibility of all persons employed by the Contractor during the term of the Contract to perform employment duties within Florida; and all persons, including subcontractors, assigned by the Contractor to perform work pursuant to the Contract.

   c. Contractor shall also be responsible for entering into an agreement, with each and every vendor and subcontractor, that states that the vendor or subcontractor (and their vendors) is independently responsible for its own employment decisions, including hiring, disciplinary and termination decisions; and is participating in the “E-Verify” program to confirm, under the terms governing use of the system, the employment eligibility of all persons assigned to perform work or provide materials and services in support of this Contract.

   d. Miami-Dade County reserves the right, at any time, to request supporting documentation, as evidence of services provided and demonstration of compliance with the above requirements.

C. Permits and Licenses

1. General:

   a. Except for permits procured by the Department, as incorporated by Special Provision to this Contract, if any, procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the Work.

b. The Department will also acquire any modifications or revisions to an original permit incorporated by Special Provision to this Contract when Contractor requires such modifications or revisions to complete the construction operations specified in the Plans or Special Provisions and within the right-of-way limits.

c. Contractor must obtain all other permits required for this Project prior to commencing the Work. This includes permits required by other municipalities and agencies, permits to work in the Right-of–Way, and those required for the removal or relocation of trees.

d. The actual amount paid for the permits will be reimbursed to Contractor from a dedicated allowance established by the County. If no dedicated allowance is specified the reimbursement shall be paid from the Contract's Contingency Allowance. Original receipts must be presented to Engineer for approval.

e. Contractor must give all notices, pay all fees and comply with all laws, rules and regulations applicable to the Work at no additional cost.

f. Acquire all permits for work performed outside the right-of-way or easements for the Project.

g. In carrying out the work in the Contract, when under the jurisdiction of any environmental regulatory agency, comply with all regulations issued by such agencies and with all general, special, and particular conditions relating to construction activities of all permits issued to the Department as though such conditions were issued to Contractor. Post all permit placards in a protected location at the worksite.

h. In case of a discrepancy between any permit condition and other Contract Documents, the more stringent condition shall prevail.

2. Additional Contractor Requirements For Work With Traffic Control Devices or Street Lighting

a. In addition to the license(s) required of Contractor, all personnel engaged in installing, modifying, repairing, removing or maintaining: roadway street lighting systems; traffic signalization; or any other electrical/electronic traffic control device in Miami-Dade County must:

1) Perform work under the direction of a Master Electrician that is present at the job site or able to respond within 2 hours of notification (4 hours for roadway street lighting systems).

2) Perform all work under the direct supervision of a Journeyman Electrician. For Traffic Signalization or Control Devices the Journeyman Electrician must be certified as an International Municipal Signal Association (IMSA) certified Traffic Signal Technician (TST) Level II or Level III. All work related at or pertaining to the controller must be performed by an IMSA certified TST Level II (Field).

3) Have in their possession a wallet size card or a photocopy of their certifications and licenses. Failure to provide said documents will be cause for removal of employee from the work site, issuance of citations, and shutdown of the Work by the County.

b. At the Preconstruction Conference, provide Engineer and the DTPW, Traffic Signal & Signs Division (7100 NW 36 Street, Miami, FL 33166) a signed affidavit affirming that the personnel performing the work described herein have all proper and valid licenses and certifications (County, State, Private or other Government Agency) required to perform the Work. Attach a list of employees assigned to this Project with a description of their duties and include copies of all of the required licenses and certifications for the Contractor and personnel performing the Work. Changes to authorized personnel must be approved by the Engineer.

c. Provide copies of renewed licenses and certifications prior to their expiration.

3. Work or Structures in Navigable Waters of the U.S., Waters of the U.S., and Waters of the State:

a. In general, one or more governmental agencies will exercise regulatory authority over work or structures, including related construction operations, in all tidal areas (channelward of the mean high water lines); in the ocean and gulf waters to the outer limits of the continental shelf; in all rivers, streams, and lakes to the ordinary high water line; in marshes and shallows that are periodically inundated and normally characterized by aquatic vegetation capable of growth and reproduction; in all artificially created channels and canals used for recreational, navigational, or other purposes that are connected to navigable waters; and in all tributaries of navigable waters up to their headwaters.

b. Whenever the work under or incidental to the Contract requires structures or dredge/fill/construction activities in "Navigable Waters of the U.S.," "Waters of the U.S.," and "Waters of the State," the Federal, State, county, and local regulatory agencies may require the Department to obtain a permit. For such dredge/fill /construction specified in the plans to be accomplished within the limits of the project, or for any dredge/fill/construction within the limits of Department-furnished borrow areas, the Department will procure the necessary permits prior to advertising for bids.

D. Patented Devices, Materials and Processes

1. Include all royalties and costs arising from patents, trademarks, and copyrights, in any way involved in the work in the Contract price. Whenever using any design, device, material, or process covered by letters patent or copyright, obtain the right for such use by suitable legal agreement with the patentee or owner of the copyright. File a copy of such agreement

with Engineer. However, whether or not such agreement is made or filed as noted, Contractor and the surety in all cases shall indemnify, defend, and save harmless, the County from all claims for infringement by reason of the use of any such patented design, device, material, or process on work under the Contract, and shall indemnify the County for all costs, expenses, and damages that it may be obliged to pay by reason of any such infringement, at any time during the prosecution or after the completion of the Work.

E. Right-of-Way Furnished by the Department

1. Except as otherwise stipulated in these Specifications or as shown in the Plans, the Department will furnish all rights-of-way necessary for the proper completion of the Work at no expense to Contractor.

F. Sanitary Provisions

1. Contractor shall provide and maintain, in a neat and sanitary condition, such accommodations for the use of his employees as are necessary to comply with the requirements and regulations of the State and local boards of health. Commit no public nuisance.

G. Control of Contractor's Equipment

1. Traffic Interference: Do not allow equipment, while it is on or traversing a road or street, to unreasonably interfere with traffic.

2. Overloaded Equipment: Do not operate on any road or street any hauling unit or equipment loaded in excess of (1) the maximum weights specified in the Florida Uniform Traffic Control Law, or (2) lower weights legally established for any section of road or bridge by the State, the Department, or local authorities. The governmental unit having jurisdiction over a particular road or bridge may provide exceptions by special permit under the provisions provided below for Crossings. This restriction applies to all roads and bridges inside and outside the Contract limits as long as these roads and bridges are open for public use. Contractor may overload roads and bridges which are to be demolished after they are permanently closed to the public. Contractor is responsible for all loss or damages resulting from equipment operated on a structure permanently closed to the public.

3. Crossings: Where it is necessary to cross an existing road or street, including specifically the existing traveled lanes of a divided highway within the limits of the Project, obtain permits from the Municipality, the Department or FDOT depending on the location, for crossing overloaded or oversized equipment. Cross existing roads or streets only at Engineer-designated points. Engineer may require Contractor to protect the pavement or Roadway at the crossing by using lumber, planks, or fill. Provide flagging and watchman service, or approved signal devices, for the protection of traffic at all such crossings, in accordance with an approved written plan for that activity.

4. Protection from Damage by Tractor-Type Equipment: Take positive measures to ensure that tractor-type equipment does not damage the road. If any such damage should occur, repair it without delay, at no expense to the County and subject to Engineer's approval.

H. Structures over Navigable Waters

1. Compliance with Federal and Other Regulations:

   a. Where erecting structures in, adjacent to, or over, navigable waters, observe all regulations and instructions of Federal and other authorities having control over such waters. Do not obstruct navigation channels without permission from the proper authority, and provide and maintain navigation lights and signals in accordance with the Federal requirements for the protection of the structure, of false work, and of navigation.

   b. In the event of accidental blocking of the navigation channel, immediately notify the U.S. Coast Guard of the blockage and upon removal of the blockage.

   c. When work platforms are indicated in the permit for construction, submit work platform construction plans to the appropriate Coast Guard District for approval. Obtain approval prior to beginning construction on the platform.

2. Maintenance of Channel: Where the work includes the excavation of a channel or other underwater areas to a required section, maintain the section from shoaling or other encroachment until final acceptance of the project.

I. Manatee Protection

1. This Subarticle applies to work in tidal waters, major canals, bodies of water where manatees have been recently spotted, or where required by any regulatory permit applicable to this Project:

   a. Instruct all personnel associated with the Project about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. Advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.

   b. Operate all vessels associated with the construction project at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

   c. Properly secure and regularly monitored all siltation or turbidity barriers to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement. Siltation or turbidity

barriers must be made of material in which manatees cannot become entangled.

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shut down if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Report any collision with or injury to a manatee immediately to the FWC Hotline at 1-888-404-3922. In addition, report collision and/or injury to the U.S. Fish and Wildlife Service in Vero Beach (1-772-562-3909), and to FWC at ImperiledSpecies@myFWC.com

f. Post, facing the water, temporary signs concerning manatees prior to and during all in-water project activities. One sign which reads “Caution: Boaters” must be posted. A second sign measuring at least 8 1/2" by 11" explaining the requirements for “Idle Speed/No Wake” and the shutdown of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. Use temporary signs that have already been approved for this use by the Florida Fish and Wildlife Conservation Commission (FWC) must be used (see MyFWC.com/manatee). Questions concerning these signs can be sent to the email address listed above. Remove all signs upon completion of the Project.

g. Comply with all manatee protection requirements of regulatory permits applicable to this Project.

J. Forest Protection

1. Compliance with State and Federal Regulations: In carrying out work within or adjacent to State or National forests or parks, comply with all of the regulations of the State or Federal authority having jurisdiction, governing the protection of and the carrying out of work in forests or parks, and observe all sanitary laws and regulations with respect to the performance of work in these areas. Keep the areas in an orderly condition, dispose of all refuse, and obtain permits for the construction, installation, and maintenance of any construction camps, living quarters, stores, warehouses, sanitary facilities, and other structures; all in accordance with the requirements of the forest or park official.

2. Prevention and Suppression of Forest Fires: Take all reasonable precautions to prevent and suppress forest fires. Require employees and subcontractors, both independently and at the request of forest officials, to do all reasonably within their power to prevent and suppress forest fires. Assist in preventing and suppressing forest fires, and make every possible effort to notify a forest official at the earliest possible moment of the location and extent of all fires. Extinguish the fire if practicable.

K. Preservation of Property

1. General:

a. Protect all geodetic monuments, horizontal or vertical, located within the limits of construction.

b. All street name signs shall remain in place during time of construction except those required to be relocated due to interference with actual construction. All signs relocated or damaged by Contractor during the course of the work shall be re-installed or replaced at the proper location, as soon as possible at Contractor’s expense.

c. Prior to the removal of any traffic control signs that interfere with the construction, Contractor shall provide temporary signing or other provisions to assure a continuous flow of traffic under at least the same conditions as previously existed.

d. All signs that are found to be unserviceable shall be reported to the Miami-Dade County, Department of Transportation and Public Works, Traffic Signals & Signs Division, at (305) 592-3580, prior to the commencement of work.

2. Contractor’s Use of Streets and Roads:

a. When hauling materials or equipment to the project over roads and bridges on the State road system, County road system, or city street system, and such use causes damage, immediately, at no expense to the County, repair such road or bridge to as good a condition as before the hauling began.

b. The Department may modify the above requirement in accordance with any agreement Contractor might make with the governmental unit having jurisdiction over a particular road or bridge, provided that Contractor submits written evidence of such agreement to Engineer prior to commencement of the Work.

c. The use of public streets and alleys shall be such as to provide a minimum of inconvenience to the public and to other traffic. Contractor shall so conduct his operations that he shall not close any thoroughfare nor interfere in any way with traffic on railway, highways, or on water, without the written consent of the proper authorities.

d. Contractor must immediately remove any earth or other excavated material spilled from trucks and clean the streets to the satisfaction of the governing authority.

e. The Department has not made any attempt to define the equipment to be used in transporting the excavated material since this may vary, however, Contractor shall abide by the following general requirements:

1) Transport vehicles must be of the type(s) approved for this application by the political jurisdiction involved.

2) General requirements are that the vehicles have watertight bodies that they are properly equipped and fitted with seals and covers to prohibit material spillage or draining, and that they are cleaned as often as is necessary to prevent deposit of material on roadways.

3) Vehicles must be loaded within all legal weight limits and operated safely within all traffic and speed regulations.

f. The Department will not allow the operation of equipment or hauling units of such weight as to cause damage to previously constructed elements of the project, including but not necessarily limited to bridges, drainage structures, base course, and pavement.

g. Do not operate hauling units or equipment loaded in excess of the maximum weights specified for Overloaded Equipment on existing pavements that are to remain in place (including pavement being resurfaced), cement-treated subgrades and bases, concrete pavement, any course of asphalt pavement, and bridges.

h. Engineer may allow exceptions to these weight restrictions for movement of necessary equipment to and from its worksite, for hauling of offsite fabricated components to be incorporated into the Project, and for crossings as specified in the Contract Documents.

3. Protection of Existing Utility Poles:

a. Ensure that existing utility poles are properly protected during installation of pipes and structures and must coordinate with the utility pole owner any safeguards necessary to protect the utility pole, including bracing of the pole, if necessary. All costs for protection of utility poles and any costs for the temporary bracing by the utility pole owner shall be the responsibility of Contractor and shall be considered incidental to and included in the Contract prices.

4. Traffic Signs, Signal Equipment, Highway Lighting and Guardrail:

a. Protect all existing roadside signs, signal equipment, highway lighting and guardrail, for which permanent removal is not indicated, against damage or displacement. Whenever such signs, signal equipment, highway lighting or guardrail lie within the limits of construction, or wherever so directed by Engineer due to urgency of construction operations, take up and properly store the existing roadside signs, signal equipment, highway lighting and guardrail and subsequently reset them at their original locations or, in the case of widened pavement or roadbed, at locations designated by Engineer.

b. If the Department determines that damage to such existing or permanent installations of traffic signs, signal equipment, highway lighting or guardrail is caused by a third party, and is not otherwise due to any fault or activities of Contractor, the Department will, with the exception of any damage resulting from vandalism, compensate Contractor for the costs associated with the repairs. Repair damage caused by vandalism at no expense to the County.

5. Operations Within Railroad Right-of-Way:

a. Notification to the Railroad Company: Notify the superintendent of the railroad company, as shown on the Plans, and Engineer at least 72 hours before beginning any operation within the limits of the railroad right-of-way; any operation requiring movement of employees, trucks, or other equipment across the tracks of the railroad company at other than an established public crossing; and any other work that may affect railroad operations or property.

b. Contractor's Responsibilities: Comply with whatever requirements an authorized representative of the railroad company deems necessary in order to safeguard the railroad's property and operations. Contractor is responsible for all damages, delays, or injuries and all suits, actions, or claims brought on account of damages or injuries resulting from Contractor's operations within or adjacent to railroad company right-of-way.

c. Watchman or Flagging Services: The railroad company will furnish protective services (i.e., watchman or flagging services) to ensure the safety of railroad operations during certain periods of the project. The Department will reimburse the railroad company for the cost thereof. Schedule work that affects railroad operations so as to minimize the need for protective services by the railroad company.

6. Utilities:

a. General:

1) Contact the Sunshine State One Call of Florida, Inc. at 1-800-432-4770 and other affected utility owners at least 48 hours prior to commencing any trenching or excavation work on this Project.

2) Make all necessary arrangements with the utility companies concerned for maintenance of their lines during the construction period. In the event that a relocation of utilities is required, but has not been accomplished prior to the effective date of the "Notice to Proceed," Contractor nevertheless must commence work under this Contract, and must schedule his work to avoid interference with the utility relocation work.

3) County will not be liable for any delay or added expense the Contractor experiences due to the activities of utility companies, nor shall the County be held responsible for any damages to any utilities due to any actions by Contractor.

b. Arrangements for Protection or Adjustment:

1) Do not commence work at points where the construction operations are adjacent to utility facilities or other property, until making arrangements with the utility facilities to protect against damage that might result in expense, loss, disruption of service, or other undue inconvenience to the public or to the owners. Contractor is solely and directly responsible to the owners and operators of such properties for all damages, injuries, expenses, losses, inconveniences, or delays caused by Contractor's operations.

2) The Department will make the necessary arrangements with utility owners for removal or adjustment of utilities where Engineer determines that such removal or adjustment is essential to the performance of the required construction. The Department will not consider relocation or adjustment requests based on Contractor's proposed use of a particular method of construction or a particular type of equipment as essential to the construction of the Project if Contractor could use other common methods and equipment without relocating or adjusting the utility. Engineer will determine the responsibility for any such required adjustments of utilities. Contractor shall make all requested relocations or adjustments because of delivery to the job site of Contractor-furnished materials, at no expense to the County.

3) The Department considers relocations and adjustments (or other protection) under the following circumstances as essential to the construction of the Project:

   a) Utilities lying within the vertical and horizontal construction limits, plus the reasonably required working room necessary for operation of equipment normally used for the particular type of construction, all as determined by Engineer (and except as provided in paragraph (d) below). (In the case of overhead electrical conductors that carry more than 400 Volts, a minimum of 10 feet clearance between the conductor and the nearest possible approach of any part of the equipment is required, except where the utility owner effects safeguards approved by OSHA.)

   b) Utilities lying within the horizontal limits of the project and within 12 inches below the ground surface or the excavation surface on which Contractor operates construction equipment, or within 12 inches below the bottom of any stabilizing course specified in the Plans.

   c) Utilities lying within the normal limits of excavation for underground drainage facilities or other structures (except as provided in paragraph (d) below). Such normal limits shall extend to side slopes along the angle of repose, as established by sound engineering practice, unless the Contract Documents require support of the excavation sides by sheeting or Contractor elects to sheet such excavation for his own convenience.

   d) Where utilities cross pipe trenches transversely within the excavation area, but not within positions from which relocation or removal is necessary, the utility owner is responsible for providing and effecting all reasonable measures for their support and protection during construction operations. Cooperate with the utility owner in the owner's effecting of such support and protective measures. Contractor is responsible for all damage to the utility that is caused by Contractor's neglect or failure to cooperate or to use proper precaution in performing his work.

4) In the event that a temporary relocation of a utility or a particular sequence of timing in the relocation of a utility is necessary, Engineer will direct such relocation so as to cause the least impediment to the overall construction operations. The Department is not responsible for utility adjustments or temporary relocation work, or for the conditions resulting there from, where such adjustments are:

   a) Not necessitated by the construction of the Project,

   b) Done solely for the benefit or convenience of the utility owner or its contractor, or Contractor where the Department considers his construction procedures to be other than normal, or

   c) Not shown on the approved plans for the utility relocation or the construction of the Project.

c. Cooperation with Utility Owners:

1) Cooperate with the owners of all underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication or rearrangement work may be reduced to a minimum, and that services rendered by the utility owners will not be unnecessarily interrupted.

2) In the event of interruption of water or other utility services as a result of accidental breakage, exposure, or lack of support, promptly notify the proper authority and cooperate with the authority in the prompt restoration of service. If water service is interrupted and Contractor is performing the repair work, Contractor shall work

continuously until the service is restored. Do not begin work around fire hydrants until the local fire authority has approved provisions for continued service.

d. Utility Adjustments:

1) Certain utility adjustments and reconstruction work may be underway during the progress of the Contract. If known prior to award, the Department will include in the Contract documents the utility authorities who are scheduled to perform utility work on the Project.

2) Cooperate with the various utility construction crews who are maintaining utility service.

3) Exercise due caution when working adjacent to relocated utilities. Repair all damage to the relocated utilities resulting from his operations at no expense to the County.

4) Protect utility facilities in accordance with the requirements of the Contract Documents and the owner.

e. Weekly Meetings:

1) Conduct weekly meetings on the job site with all the affected utility companies and Engineer in attendance to coordinate project construction and utility relocation. Submit a list of all attendees one week in advance to Engineer for approval.

2) Provide the approved Work Progress Schedule and Work Plan for the Project, as specified in the Contract Documents, to document the schedule and plan for road construction and utility adjustments.

3) When utility relocations no longer affect construction activities, Contractor may discontinue the meetings with Engineer's approval.

L. Responsibility for Damages, Claims, etc.

1. Contractor to Provide Indemnification:

a. Contractor shall indemnify and hold harmless the County, its officers and employees from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of Contractor and persons employed or utilized by Contractor in the performance of the construction Contract.

b. It is specifically agreed between the parties executing this Contract that it is not intended by any of the provisions of any part of the Contract to create in the public or any member thereof, a third party beneficiary hereunder, or to authorize anyone not a party to this Contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Contract.

2. Guaranty of Payment for Claims: Contractor guaranties the payment of all just claims for materials, supplies, tools, or labor and other just claims against him or any subcontractor, in connection with the Contract. The Department's final acceptance and payment does not release Contractor's bond until all such claims are paid or released.

M. Contractor's Responsibility for Work

1. Until the Department's acceptance of the work, take charge and custody of the work, and take every necessary precaution against injury or damage to the work by the action of the elements or from any other cause whatsoever, arising either from the execution or from the nonexecution of the work. Rebuild, repair, restore, and make good, without additional expense to the Department, all injury or damage to any portion of the work occasioned by any of the above causes before its completion and acceptance, except that in case of extensive or catastrophic damage, the Department may, at its discretion, reimburse Contractor for the repair of such damage due to unforeseeable causes beyond the control of and without the fault or negligence of Contractor, including but not restricted to Acts of God, of the public enemy, or of governmental authorities.

N. Opening Sections of Roadway to Traffic

1. Whenever any bridge or section of roadway is in an acceptable condition for travel, Engineer may direct Contractor to open it to traffic. The Department's direction to open a bridge or roadway does not constitute an acceptance of the bridge or roadway, or any part thereof, or waive any Contract provisions. Perform all necessary repairs or renewals, on any section of the roadway or bridge thus opened to traffic under instructions from Engineer, due to defective material or work or to any cause other than ordinary wear and tear, pending completion and Engineer's acceptance of the roadway or bridge, or other work, at no expense to the County.

O. Scales for Weighing Materials

1. Applicable Regulations: When determining the weight of material for payment, use scales meeting the requirements of Chapter 531, F.S., pertaining to specifications, tolerances, and regulations, as administered by the Bureau of Weights and Measures of the Florida Department of Agriculture.

2. Base for Scales: Place such scales on a substantial horizontal base to provide adequate support and rigidity and to maintain the level of the scales.

3. Protection and Maintenance: Maintain all scale parts in proper condition as to level and vertical alignment, and fully protect them against contamination by dust, dirt, and other matter that might affect their operation.

P. Source of Forest Products

1. As required by Section 255.20, F.S., where price and quality are equal, and when available, use only timber, timber piling, or other forest products that are produced and manufactured in the State of Florida. This provision does not apply to Federal-aid projects.

Q. Dust Control

1. Dust control measures are required as necessary to prevent the surface and air transport of dust from any construction activity performed under this contract. This may include but is not limited to: Pre-watering deeply before excavation; scheduling thorough and consistent watering that does not run off the site; applying best management practices in the loading, offloading, and transport of soils and miscellaneous materials; covering or otherwise stabilizing piles when necessary; and planning schedules so control measures are available throughout the project.
2. Ensure that excessive dust is not transported beyond the limits of construction in populated areas. Contractor may control dust for embankments or other cleared or unsurfaced areas by applying water, as directed by Engineer. When included in the Plans, install mulch, seed, sod, or temporary paving as early as practical. Control dust during the storage and handling of dusty materials by wetting, covering, or other means as approved by Engineer.
3. When cutting through concrete, care should be exercised to prevent dust from becoming air borne. Contractor must use an engineering control such as the use of a wet saw or dust collector. Engineer shall have the final determination when in a particular circumstance this is not feasible, and the concrete must be cut dry.
4. No separate item for dust control measures is included for payment in this Contract. Contractor must consider the cost of any dust control measures that is necessary for the proper construction of the Project as included in the Contract price for items of work for which dust control measures are required.

R. Dredging and Filling

1. Section 370.033, F.S., requires that all persons, who engage in certain dredge or fill activities in the State of Florida, obtain a certificate of registration from the Florida Department of Environmental Protection, Tallahassee, Florida 32301, and that they keep accurate logs and records of all such activities for the protection and conservation of the natural resources. Obtain details as to the application of this law from the Department of Environmental Protection and contact local regulatory agencies for additional applicable requirements.

S. Contractor's Motor Vehicle Registration

1. Provide the Department with proof that all motor vehicles operated or caused to be operated by such Contractor are registered in compliance with Chapter 320, F.S. Submit such proof of registration in the form of a notarized affidavit to the Department.
2. The Department will not make payment to Contractor until the required proof of registration is on file with the Department.

T. Compliance with FHWA 1273:

1. For federally funded projects and when required by law, comply with the provisions contained in FHWA-1273.
2. The FHWA-1273 Electronic version, dated May 1, 2012 is posted on the FDOT's website at the following URL address: http://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Default.shtm.
3. Take responsibility to obtain this information and comply with all requirements posted on this website up through five calendar days before the opening of bids.
4. If the FDOT website cannot be accessed, contact FDOT Department's Specifications Office Web Coordinator at (850) 414-4101.

1.06 PROSECUTION AND PROGRESS

A. Subletting Or Assigning The Contract

1. Contractor must perform, with its own organization, contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the Contract Documents) of the total original contract price, excluding any specialty items designated by the County. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization.
   a. "Its own organization" is construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.
   b. "Specialty Items" is construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount, upon which the requirements set forth in this Subarticle is computed, includes the cost of material and manufactured products which are to be purchased or produced by the Contractor under the provisions of the Contract.
3. Contractor must furnish:

a. A competent superintendent or supervisor who is employed by its firm, has full authority to direct performance of the Work in accordance with the Contract requirements, and is in charge of all construction operations (regardless of who performs the work); and

b. Such other of its own organizational resources (supervision, management, and engineering services) as the Engineer determines is necessary to assure the performance of the Contract.

B. Notice to Proceed

1. Unless otherwise agreed to by the parties, the Department may issue the Notice to Proceed (NTP) within 30 Days after all conditions for Contract execution have been met. The NTP will identify the date Contractor is to begin the construction and will start the Contract Time.

C. Schedule Of Values

1. A Schedule of Values is required for any Stipulated (Lump) sum contract, or for major lump sum items on Unit price contracts for which Contractor requests progress (milestone) payments.

2. Upon notification of intent to Award and prior to the Notice to Proceed, submit to Engineer for review and approval, a preliminary Schedule of Values that:

a. Logically subdivides the Work into component parts or major project milestones with sufficient detail to serve as the basis for progress payments during performance of the Work and correlates to the Work Progress Schedule.

b. Includes quantities and prices of items for all of the Work which when added together equal either the Contract Base Award Amount for a Stipulated sum contract or the Contract Price for a major lump sum item in a Unit price contract.

3. The Schedule of Values for a Stipulated sum contract, or for major lump sum items on Unit price contracts, will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Base Award Amount to component parts of the Work or significant milestones.

4. When directed by Engineer, submit at least 10 days prior to the next application for progress payment, a revised or updated Schedule of Values to address any changes in the Work.

D. Preconstruction Conference

1. A Preconstruction Conference will be held with Contractor, members of the Department and other Miami-Dade County Agencies, representative of Utility Companies, and other municipalities or contractors affected by the Work. The Department will set the time and place of this conference.

2. Submit the following items (as applicable to the Work) to Engineer at the Preconstruction Conference unless otherwise noted:

a. Two copies of the proposed Work Progress Schedule. (Provide an updated schedule within 5 days of each Work Order for work order contracts.)

b. Contractor's Chain of Authority.

c. Contractor's Emergency Telephone Numbers, during work hours, after hours, and on weekend, of Prime and MOT Contractor's Representatives.

d. Letter naming Contractor's Superintendent and his qualifications.

e. Letter naming Contractor's Work Site Traffic Supervisor and a copy of their respective Certification(s).

f. Letter naming Contractor's MOT Flagmen and a copy of their training Certification(s).

g. Maintenance of Traffic Plan: Letter outlining the Specific Maintenance of Traffic Plan or Plans that will be used during construction. If the MOT plan is noted in the Construction Plans, Contractor is to affirm in writing that the same shall be followed. MOT plans must be submitted within 5 days of the date of each Work Order for work order contracts.

h. Shop drawing submittal schedule. To be submitted within 5 days of the date of each Work Order for work contracts.

i. List of potential subcontractors and rental agreements.

j. Letter listing the material providers for this project, with the respective name and address; and letter certifying the compliance of the material with the project requirements.

k. List of equipment to be utilized for construction; including make, model, year, name and description of equipment.

l. Contractor's Erosion Control Plan (ECP) pursuant to the requirements of the Contract Documents.

m. Lighting plan if Contractor intends to perform any night work.

n. All other submittal requirements stipulated in the Contract Documents.

E. Scheduling of the Work

1. Work Progress Schedule.

a. Within 21 days after Contract award or at the Preconstruction Conference, whichever is earlier, submit to Engineer for approval two copies of a Work Progress Schedule for this Project. Engineer will review and respond to Contractor within 15 days of receipt.

b. The Work progress Schedule, arranged by major project milestones, must show the various activities of work in sufficient detail to demonstrate a reasonable and workable plan to initiate, construct, and complete all requirements

of the Contract Documents within the Contract Duration and must, by task grouping:

1) Include a projected Project completion, measured in dollars and time, on a monthly basis or at each progress payment cutoff date.

2) Identify a date for substantial completion with "sufficient time" between substantial completion and end of Contract Duration for final inspections, final roadway striping if required, development of a punch list by the Engineer, completion of all punch list items by Contractor, final submittals, and any remaining site restoration activities. "Sufficient time," as it pertains solely to this requirement, means no less than 60 days unless otherwise required by the Contract Documents or approved in writing by Engineer.

3) Include the order and interdependence of activities and the sequence for accomplishing the Work including phased restoration of areas impacted by work.

4) Describe activities in sufficient detail so that the Engineer can readily identify the Work and measure the progress of each activity.

5) Show each activity with a beginning work date, activity duration, and a monetary value.

6) Include within the activities the necessary steps for procurement, fabrication, and delivery of materials, plant, and equipment.

7) Include the review time for shop drawings and submittals.

8) Include the Critical Path and milestone activities when milestones are required by the Contract Documents.

9) In projects with more than one phase, adequately identify each phase and its substantial completion date, and do not allow phase specific activities to span more than one phase.

c. Submit with the Work Progress Schedule a narrative report describing current project schedule status and identifying potential delays. This report will include a description of the progress made since the previous schedule submission and objectives for the upcoming 30 calendar days. It will be submitted on 8.5 by 11 inch paper. This report shall at a minimum include the following information:

1) Indicate if the Project is on schedule, ahead of schedule or behind schedule. If the Project is ahead of schedule or behind schedule, the report shall include the specific number of calendar days. If the Project is behind schedule, the report shall include a detailed recovery plan that will put the Project back on schedule.

2) The report will describe the current critical path of the Project and indicate if this has changed in the last 30 calendar days. Discuss current successes or problems that have affected either the critical path's length or have caused a shift in the critical path within the last 30 calendar days. Identify specific activities, progress, or events that may reasonably be anticipated to impact the critical path within the next 30 calendar days, either to affect its length or to shift it to an alternate path.

3) List all schedule logic or duration changes that have been made to the schedule since the previous submission. For each change, describe the basis for the change and specifically identify the affected activities by identification number.

4) Identify any and all activities, either in progress or scheduled to occur within the following 30 days that require County participation, review, approval, etc.

d. Submit, with the Work Progress Schedule, clear documentation demonstrating that all necessary coordination activities with utility owners that have facilities within the limits of construction have been conducted. In addition, incorporate into the work progress schedule any utility adjustment schedules included in the Contract Documents unless the utility company and the Department mutually agree to changes to the utility schedules shown in the Contract.

e. Engineer will return inadequate schedules to Contractor for corrections. Resubmit a corrected schedule within 15 days from the date of Engineer's return transmittal.

f. Submit an updated Work Progress Schedule, for Engineer's acceptance, if there is a significant change in the planned order or duration of an activity. Engineer will review the corrected schedule and respond within 7 days of receipt.

g. By acceptance of the schedule, Engineer does not endorse or otherwise certify the validity or accuracy of the activity durations or sequencing of activities. Engineer will use the accepted schedule as a baseline against which to measure the progress.

h. If Contractor fails to finalize either the initial or a revised schedule in the time specified, Engineer will withhold all Contract payments until Engineer accepts the schedule.

2. Weekly Work Progress Meetings:

a. Coordinate weekly meetings to discuss Contract progress with Engineer including near term scheduled activities, utility relocations, and problems and their proposed solutions.

b. Submit a Two-Week "Look Ahead" Planning Schedule at each weekly meeting, showing the items of work planned for the next two weeks. Develop the schedule in Bar Chart format, identifying current and planned activities and

related Contract Schedule work activities, including subcontractor work. Designate all activities that are controlling work items as determined by the currently accepted Contract Schedule.

c. A report shall be submitted at each weekly meeting identifying schedule activity progress including actual start or finish dates achieved for any activities.

3. Prosecution of the Work.

a. Give the Work the constant attention necessary to ensure the scheduled progress, and cooperate fully with Engineer and with other contractors at work in the vicinity.

b. Do not commence work under the Contract until after the Department has issued the Notice to Proceed. Thereafter, commence the Work and continue all work in an expeditious manner to a conclusion acceptable to Engineer and in accordance with the approved Work Progress Schedule.

c. Compliance with Time Requirements: Commence work in accordance with the approved Work Progress Schedule and provide sufficient labor, materials and equipment to complete all work as scheduled. Should Contractor fail to furnish sufficient and suitable equipment, forces, and materials, as necessary to prosecute the Work in accordance with the required schedule, Engineer may withhold all progress payments that are, or may become due, or suspend the work until Contractor corrects such deficiencies.

d. Provisions for Convenience of Public: Schedule construction operations so as to minimize any inconvenience to adjacent businesses or residences. Where necessary, Engineer may require Contractor to first construct the work in any areas along the Project where inconveniences caused by construction operations would present a more serious handicap. In such critical locations, where there is no assurance of continuous effective prosecution of the work once the construction operations are begun, Engineer may require Contractor to delay removal of the existing (usable) facilities.

e. The lack of equipment or unsuitability of said equipment shall not be an acceptable reason for falling behind schedule.

f. If Contractor fails to complete all work under the Contract, within the time specified in the "Notice to Proceed" and/or Work Order(s), or fails to perform the Work with sufficient personnel and equipment or with sufficient materials to assure the prompt completion of the work assigned, or discontinues the prosecution of the Work, or fails to resume work which has been discontinued within a reasonable time after notice to do so, or becomes insolvent or is declared bankrupt, or files for reorganization under the bankruptcy or insolvency code, or for any other cause whatsoever, fails to carry on the work in an acceptable manner, or if the surety executing the bond, becomes unsatisfactory in the opinion of the County, Engineer will give notice in writing to Contractor and his surety of such delay, neglect, or default. Additionally, the County may opt to not issue further Work orders and/or to terminate the Contract in addition to assigning a non-responsive Contractor Evaluation rating. Continuous failure by Contractor to complete work in a timely fashion may result in the County not issuing further work and/or cancellation of the Contract.

F. Progress of the Work.

1. Unless otherwise stipulated herein, progress of the Work will be evaluated monthly and compared to the approved Work Progress Schedule.

a. When dollars invoiced by Contractor on the Project are 15 percent greater than the estimated dollars for the work scheduled, Engineer may request in writing, that Contractor submit a revised Work Progress Schedule for approval by the next scheduled monthly submittal date.

b. When the dollars earned by Contractor on the Project are 15 percent less than the estimated dollars for the work scheduled, Engineer may deem the progress of the Work unsatisfactory and will issue a notice to Contractor of unsatisfactory performance.

c. In the event a noncritical item becomes critical as determined by Engineer, Contractor must submit a revised CPM schedule.

d. When an activity on the critical path, as shown on the current approved Work Progress Schedule, has exceeded its late start date by 7 Days, Engineer will deem the progress of Work unsatisfactory and will hold a meeting with Contractor to address the schedule within 7 Days of the discovery. If a resolution cannot be determined within 5 Days, Engineer will issue a notice to Contractor of unsatisfactory performance.

e. When it becomes apparent that an activity on the critical path, as shown on the current approved Work Progress Schedule, has exceeded its original duration by 10 or more Days, regardless of the Contract's definition of Contract Time, Contractor must submit a revised Work Progress Schedule for approval within 5 Days of the discovery and Engineer will issue a notice of unsatisfactory performance to the Contractor and identify the unsatisfactory performance.

2. The notice of unsatisfactory performance will also allow a reasonable period of time, as determined by Engineer but not to exceed 30 Days from receipt of the notice, for Contractor to bring the progress of the Work into compliance with the current accepted work progress schedule or to provide acceptable written justification for the delay. Contractor must do the following things within the time specified in the notice to Contractor of unsatisfactory performance:

a. Submit a revised baseline progress schedule and recovery plan to Engineer for review and approval. Demonstrate the proposed method to complete the Project within the remaining time specified in the current accepted work progress schedule; and

b. If Contractor is unable to provide such a revised schedule, a late completion schedule shall be submitted indicating the time required to complete the Work. The Department's approval of the late completion schedule will not operate as a waiver of the Department's right to assess liquidated damages;

c. Take all necessary action, subject to Engineer's approval, to ensure completion of the Project at no additional cost to the Department within the remaining time specified in the accepted schedule. Actions may include but not be limited to the following:

1) Additional overtime;

2) Added work shift;

3) Additional workforce;

4) Extended workweek;

5) Additional Equipment; or

6) A combination of these.

G. Performance of Work

1. Give due and adequate notices to those in control of all properties that may be affected by the construction activities.

2. Keep on the job site sufficient plant and equipment to meet the requirements of the Work. The plant shall be kept in a satisfactory operating condition and be capable of safely and efficiently performing the Work as set forth in the Plans and Specifications. The equipment and all operations shall be subject to inspection by Engineer at all times.

3. Submit for approval by Engineer, a description of the type of materials and equipment to be used; and the method of procedure to be used in the performance of the Work.

4. Condition of Equipment

a. All equipment used in the performance of the Work must be in first class operating condition, including proper mufflers and other silencing accessories. All equipment must be properly lubricated on a special maintenance type schedule to reduce noise, including tracks, rollers, idlers, sheaves and other noise producing components. Care must be taken to prevent oil spillage of any kind or oil dripping from equipment. All dewatering pumps and welding machines must be engine driven or powered by Contractor furnished generators. The temporary power source available at the jobsite is not sufficient to power that type of equipment.

b. If the equipment used proves less than satisfactory and is unduly or needlessly disturbing the neighbors, in the opinion of Engineer, he will have the right to order Contractor to immediately modify the equipment to make it satisfactory, or to change to other equipment that is satisfactory at no additional cost to the County.

5. Saw Cutting:

a. When required in performance of this Contract, material may be removed by either saw cutting the slab perpendicular to the long edge, or by any other means that will produce a clean neat cut and that is acceptable to Engineer. All costs for saw cutting and/or any other necessary means for accomplishing the bid items listed in this Contract shall be included in the cost for said item.

6. Open Excavations:

a. At the close of each workday, Contractor shall refill all open excavations, or cover open excavations with steel plates capable of supporting vehicular traffic at no additional cost to the County.

7. Florida Trench Safety Act

a. The Florida Trench Safety Act (Sections 553.60-553.64, Florida Statutes) is hereby incorporated by reference and made a part of these Specifications. The purpose and intention of the State of Florida "Trench Safety Act" is to provide for increased worker safety by requiring compliance with sufficient standards for trench safety and providing additional specific requirements when the excavation is in excess of 5 feet deep. By executing the Contract, Contractor certifies that he is fully aware of the Trench Safety Act, and will comply with applicable trench safety standards.

b. In accordance with Sections 553.60-553.64, F.S., the bidder acknowledges those included in the various items of the proposal and in the total bid price are costs for complying.

H. Limitations of Operations

1. General:

a. Subject to any provision to the contrary provided in these Contract Documents, Work must not be carried out during the night or on Saturdays, Sundays or on County holidays without prior written approval from Engineer issued at least 72 hours before these times so that proper inspection and engineering services may be scheduled.

b. Prior written approval from Engineer, as specified in this Article, is not required for the performance of work that is necessary for proper care, maintenance, and protection of Work already done, or in cases when the Work would otherwise be endangered or when hazard to life or property would result, in which case Contractor must inform Engineer at the earliest possible opportunity of the same.

c. All construction activities, designated by Engineer as requiring inspection by the County, must be scheduled to coincide with the hours of availability of Engineer or Engineer's duly authorized inspector. The hours of availability are from 7:00 AM until 4:30 PM Monday through Friday; unless otherwise approved by the Engineer, these construction activities must be scheduled to coincide with the aforementioned hours of availability.

d. Work performed without the prior written approval of Engineer and without an Engineer's duly authorized inspector may be declared defective solely on the grounds that it was not properly inspected.

e. Contractor must conform to all applicable laws, regulations, or ordinances with regard to labor employed, hours of work and general operations.

2. Night Work:

a. Night work may be undertaken as a regular procedure when required by the Contract Documents or approved in writing by Engineer. Such approval, however, may be revoked at any time by Engineer if Contractor fails to maintain adequate equipment, lighting, and supervision for the proper prosecution and control of the Work at night pursuant to the requirements herein.

b. For the purposes of this Article, the term "night" shall mean the period from 6:00 p.m. to 7:00 a.m. Due to traffic interference concerns, authorized night construction activities that may be disruptive to traffic flow can only be performed weekdays between 9:00 p.m. to 5:00 a.m.

c. Prepare a specific work plan and submit it to the Engineer for approval at least one week in advance of the anticipated work. The plan must include a schedule of all activities of work and show in detail the special arrangements that will be made to provide for all regulatory and Contract requirements including cordoning off the areas with sufficient roadwork safety signs; providing approved MOT; worksite personnel and citizen safety; necessary lighting; and daily restoration of the work site.

d. Obtain and comply with all necessary permits and authorizations from the applicable jurisdictions.

e. Complete all scheduled work and restore the work site as required in the Engineer's approval.

f. Lighting during nighttime operations:

1) During active nighttime operations, furnish, place and maintain lighting sufficient to permit proper workmanship and inspection. Use lighting with 5 ft•cd minimum intensity. Arrange the lighting to prevent interference with traffic or produce undue glare to property owners. Operate such lighting only during active nighttime construction activities. Provide a light meter to demonstrate that the minimum light intensity is being maintained.

2) Lighting may be accomplished by the use of portable floodlights, standard equipment lights, existing street lights, temporary street lights, or other lighting methods approved by Engineer.

3) Submit a lighting plan at the Preconstruction Conference for review and acceptance by Engineer. Submit the plan on standard size plan sheets (not larger than 24 by 36 inch), and on a scale of either 100 or 50 feet to 1 inch. Do not start night work prior to the Engineer's acceptance of the lighting plan.

4) During active nighttime operations, furnish, place and maintain variable message signs to alert approaching motorists of lighted construction zones ahead. Operate the variable message signs only during active construction activities.

5) Where night work is required by the Contract Documents, include compensation for lighting for night work in the Contract prices for the various items of the Contract. Take ownership of all lighting equipment for night work.

3. Sequence of Operations: Do not open up work to the prejudice of work already started. Engineer may require Contractor to finish a section on which work is in progress before starting work on any additional section.

4. Interference with Traffic:

a. At all times conduct the Work in such manner and in such sequence as to ensure the least practicable interference with traffic. Operate all vehicles and other equipment safely and without hindrance to the traveling public. Park all private vehicles outside the clear zone. Place materials authorized to be stored along the roadway so as to cause no obstruction to the traveling public as possible.

b. Where existing pavement is to be widened and stabilizing is not required, prevent any open trench from remaining after working hours by scheduling operations to place the full thickness of widened base by the end of each day. Do not construct widening strips simultaneously on both sides of the road, except where separated by a distance of at least 1/4 mile along the road and where either the work of excavation has not been started or the base has been completed.

5. Coordination with other contractors:

a. Sequence the work and dispose of materials so as not to interfere with the operations of other contractors engaged upon adjacent work; join the work to that of others in a proper manner, in accordance with the spirit of the Contract Documents; and perform the work in the proper sequence in relation to that of other contractors; all as may be directed by Engineer.

b. Contractor is responsible for any damage done by him or his agents to the work performed by another contractor.

6. Drainage: Conduct the operations and maintain the work in such condition to provide adequate drainage at all times. Unless otherwise required by the Contract Documents, do not obstruct existing functioning storm drains, gutters, ditches, and other run-off facilities.

7. Fire Hydrants: Keep fire hydrants on or adjacent to the roadway accessible to fire apparatus at all times, and do not place any material or obstruction within 15 feet of any fire hydrant.

8. Protection of Structures: Do not operate heavy equipment close enough to pipe headwalls or other structures to cause their displacement.

9. Fencing: Erect permanent fence as a first order of business on all projects that include fencing where Engineer determines that the fencing is necessary to maintain the security of livestock on adjacent property, or for protection of pedestrians who are likely to gain access to the project from adjacent property.

10. Hazardous or Toxic Waste:

a. When the construction operations encounter or expose any abnormal condition that may indicate the presence of a hazardous or toxic waste, discontinue such operations in the vicinity of the abnormal condition and notify Engineer immediately. Be alert for the presence of tanks or barrels; discolored earth, metal, wood, ground water, etc.; visible fumes; abnormal odors; excessively hot earth; smoke; or other conditions that appear abnormal as possible indicators of hazardous or toxic wastes and treat these conditions with extraordinary caution.

b. Make every effort to minimize the spread of any hazardous or toxic waste into uncontaminated areas.

c. Do not resume the construction operations until so directed by Engineer.

d. Dispose of the hazardous or toxic waste in accordance with the requirements and regulations of any Local, State, or Federal agency having jurisdiction. Where Contractor performs work necessary to dispose of hazardous or toxic waste, and the Contract does not include pay items for disposal, the Department will pay for this work as unforeseeable work.

e. The Department may agree to hold harmless and indemnify Contractor for damages when Contractor discovers or encounters hazardous materials or pollutants during the performance of services for the Department when the presence of such materials or pollutants were unknown or not reasonably discoverable. Such indemnification agreements are only effective if Contractor immediately stops work and notifies the Department of the hazardous material or pollutant problem.

f. Such indemnification agreement is not valid for damages resulting from Contractor's willful, wanton, or intentional conduct or the operations of Hazardous Material Contractors.

I. Qualifications of Contractor's Personnel

1. Meet the personnel qualifications requirements stipulated in FDOT Specification Section 105 for construction crew.

2. Provide competent, careful, and reliable superintendents, foremen, and workmen. Provide workmen with sufficient skill and experience to properly perform the work assigned to them. Provide workmen engaged on special work, or skilled work, such as bituminous courses or mixtures, concrete bases, pavements, or structures, or in any trade, with sufficient experience in such work to perform it properly and satisfactorily and to operate the equipment involved. Provide workmen that shall make due and proper effort to execute the work in the manner prescribed in the Contract Documents, or Engineer may take action as prescribed below.

3. It is prohibited as a conflict of interest for a Contractor to subcontract with a Consultant to perform Contractor Quality Control when the Consultant is under contract with the Department to perform work on any project described in Contractor's Contract with the Department. Prior to approving a Consultant for Contractor Quality Control, Contractor shall submit to the Department a Certificate from the proposed Consultant certifying that no conflict of interest exists.

4. Whenever Engineer determines that any person employed by Contractor is incompetent, unfaithful, intemperate, disorderly, or insubordinate, Engineer will provide written notice and Contractor shall discharge the person from the work. Do not employ any discharged person on the Project without the written consent of Engineer. If Contractor fails to remove such person or persons, Engineer may withhold all payments that are or may become due, or suspend the work until Contractor complies with such orders. Protect, defend, indemnify, and hold the County, its agents, officials, and employees harmless from all claims, actions, or suite arising from such removal, discharge, or suspension of employees.

J. Temporary Suspension of Contractor's Operations

1. Authority to Suspend Contractor's Operations:

a. Engineer has the authority to suspend Contractor's operations, wholly or in part. Engineer will order such suspension in writing, giving in detail the reasons for the suspension. Contract Time will be charged during all suspensions of Contractor's operations.

b. Any work in the public right of way may be temporarily suspended by the roadway governing authority. If an extension of Contact time is authorized pursuant to the requirements of the Contract Documents, it will be of a non-compensable nature. All costs associated with

temporary suspension including any demobilization or re-mobilization costs are the sole responsibility of the Contractor and no extra compensation will be allowed.

c. No additional time extension will be granted to Contractor when the operations are suspended for the following reasons:

1) Contractor fails to comply with the Contract Documents.

2) Contractor fails to carry out orders given by Engineer.

3) Contractor causes conditions considered unfavorable for continuing the Work.

d. Immediately comply with any suspension order. Do not resume operations until authorized to do so by Engineer in writing. Any operations performed by Contractor, and otherwise constructed in conformance with the provisions of the Contract, after the issuance of the suspension order and prior to Engineer's authorization to resume operations will be at no cost to the County. Further, failure to immediately comply with any suspension order will also constitute an act of default by Contractor and is deemed sufficient basis in and of itself for the Department to declare Contractor in default, with the exception that Contractor will not have ten calendar days to correct the conditions for which the suspension was ordered.

2. Prolonged Suspensions: If Engineer suspends Contractor's operations for an indefinite period, store all materials in such manner that they will not obstruct or impede the traveling public unnecessarily or become damaged in any way. Take every reasonable precaution to prevent damage to or deterioration of the work performed. Provide suitable drainage of the roadway by opening ditches, shoulder drains, etc., and provide any temporary structures necessary for public travel through the project.

3. Permission to Suspend Contractor's Operations: Do not suspend operations or remove equipment or materials necessary for completing the work without obtaining Engineer's written permission. Submit all requests for suspension of operations in writing to Engineer, and identify specific dates to begin and end the suspension. Contractor is not entitled to any additional compensation for suspension of operations during such periods.

4. Suspension of Contractor's Operations-Holidays:

a. Unless Contractor submits a written request to work on a holiday at least ten days in advance of the requested date and receives written approval from Engineer, Contractor must not work on the following days: Martin Luther King, Jr. Day; President's Day, Memorial Day; the Saturday and Sunday immediately preceding Memorial Day; Independence Day; Labor Day; the Saturday, and Sunday immediately preceding Labor Day; Columbus Day, Veterans' Day; Thanksgiving Day; the Friday, Saturday and Sunday immediately following Thanksgiving Day; and December 24 through January 2, inclusive. Contract Time will be charged during these holiday periods regardless of whether or not Contractor's operations have been suspended.

b. During such suspensions, remove all equipment and materials from the clear zone, except those required for the safety of the traveling public and retain sufficient personnel at the job site to properly meet all applicable requirements for: (1) Maintenance of Traffic; and (2) Prevention, Control, and Abatement of Erosion and Water Pollution. Contractor is not entitled to any additional compensation for removal of equipment from clear zones or for compliance with the aforementioned requirements during such holiday periods.

K. Computation of Contract Time

1. Date of Beginning of Contract Time: The Contract Time begins on the effective start date of the "Notice to Proceed." Perform the Work fully, entirely, and in accordance with the Contract Documents within the Contract Time(s) specified in the Contract Documents, or as may be extended in accordance with the provisions herein.

2. Contract Time Extensions:

a. The Department will consider the delays in delivery of materials or component equipment that affect progress on a controlling item of work as a basis for granting a time extension if such delays are beyond the control of Contractor or supplier. Such delays may include an area-wide shortage, an industry-wide strike, or a natural disaster that affects all feasible sources of supply. In such cases, Contractor shall furnish substantiating letters from a representative number of manufacturers of such materials or equipment clearly confirming that the delays in delivery were the result of an area-wide shortage, an industry-wide strike, etc. No additional compensation will be made for delays caused by delivery of materials or component equipment.

b. The Department will not consider requests for time extension due to delay in the delivery of custom manufactured equipment including traffic signal equipment, highway lighting equipment, etc., unless Contractor furnishes documentation that the order for such equipment was placed in a timely manner, the delay was caused by factors beyond the manufacturer's control, and the lack of such equipment caused a delay in progress on a controlling item of work. No additional compensation will be paid for delays caused by delivery of custom manufactured equipment.

c. The Department will consider the effect of utility relocation and adjustment work on job progress as the basis for granting a time extension only if all the following criteria are met:

1) Delays are the result of either utility work that was not detailed in the plans, or utility

work that was detailed in the plans but was not accomplished in reasonably close accordance with the schedule included in the Contract Documents.

2) Utility work actually affected progress toward completion of controlling work items.

3) Contractor took all reasonable measures to minimize the effect of utility work on job progress, including cooperative scheduling of Contractor's operations with the scheduled utility work at the preconstruction conference and providing adequate advance notification to utility companies as to the dates to coordinate their operations with Contractor's operations to avoid delays.

d. As a condition precedent to an extension of Contract Time, Contractor must submit to Engineer:

1) A preliminary request for an extension of Contract Time made in writing to Engineer within ten calendar days after the commencement of a delay to a controlling item of work. If Contractor fails to submit this required preliminary request for an extension of Contract Time, Contractor fully, completely, absolutely and irrevocably waives any entitlement to an extension of Contract Time for that delay. In the case of a continuing delay only a single preliminary request for an extension of Contract Time will be required. Each such preliminary request for an extension of Contract Time shall include as a minimum the commencement date of the delay, the cause of the delay, and the controlling item of work affected by the delay; and

2) Further, Contractor must submit to Engineer a request for a Contract Time extension in writing within 30 days after the elimination of the delay to the controlling item of work identified in the preliminary request for an extension of Contract Time. Each request for a Contract Time extension shall include as a minimum all documentation that Contractor wishes the Department to consider related to the delay, and the exact number of days requested to be added to Contract Time. If Contractor contends that the delay is compensable, then Contractor is also required to submit with the request for a Contract Time extension a detailed cost analysis of the requested additional compensation. If Contractor fails to submit this required request for a Contract Time extension, with or without a detailed cost analysis, depriving Engineer of the timely opportunity to verify the delay and the costs of the delay, Contractor waives any entitlement to an extension of Contract Time or additional compensation for the delay.

e. Upon timely receipt of the preliminary request of Contract Time from Contractor, Engineer will investigate the conditions, and if it is determined that a controlling item of work is being delayed for reasons beyond the control of Contractor, Engineer will take appropriate action to mitigate the delay and the costs of the delay. Upon timely receipt of the request for a Contract Time extension Engineer will further investigate the conditions, and if it is determined that there was an increase in the time or the cost of performance of the controlling item of work beyond the control of Contractor, then an adjustment of Contract Time will be made, and a monetary adjustment will be made, excluding loss of anticipated profits, and the Contract will be modified in writing accordingly.

f. The existence of an accepted schedule, including any required update(s), as required by the Contract Documents is a condition precedent to Contractor having any right to the granting of an extension of contract time or any monetary compensation arising out of any delay. Contractor failure to have an accepted schedule, including any required update(s), for the period of potential impact, or in the event the currently accepted schedule and applicable updates do not accurately reflect the actual status of the project or fail to accurately show the true controlling or non-controlling work activities for the period of potential impact, will result in any entitlement determination as to time or money for such period of potential impact being limited solely to the Department's analysis and identification of the actual controlling or non-controlling work activities. Further, in such instances, the Department's determination as to entitlement as to either time or compensability will be final.

L. Default and Termination of Contract

1. Determination of Default:

a. The following acts or omissions constitute acts of default and, except as to subparagraph 10) below, the Department will give notice, in writing, to Contractor and his surety for any delay, neglect or default, if Contractor:

1) Fails to begin the work under the Contract within the time specified in the Notice to Proceed;

2) Fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure prompt completion of the Contract;

3) Performs the work unsuitably, or neglects or refuses to remove materials or to perform anew such work that Engineer rejects as unacceptable and unsuitable;

4) Discontinues the prosecution of the work, or fails to resume discontinued work within a reasonable time after Engineer notifies Contractor to do so;

5) Becomes insolvent or is declared bankrupt, or files for reorganization under the bankruptcy code, or commits any act of bankruptcy or insolvency, either voluntarily or involuntarily;

6) Allows any final judgment to stand against him unsatisfied for a period of ten calendar days;

7) Makes an assignment for the benefit of creditors;

8) Fails to comply with Contract requirements regarding minimum wage payments or Small Business Enterprise or Equal Employment Opportunity requirements;

9) Fails to comply with Engineer's written suspension of work order within the time allowed for compliance and which time is stated in that suspension of work order; or

10) For any other cause whatsoever, fails to carry on the work in an acceptable manner, or if the surety executing the bond, for any reasonable cause, becomes unsatisfactory in the opinion of the Department.

b. For a notice based upon reasons stated in subparagraphs a. 1) through 8) and 10) above: if Contractor, within a period of ten calendar days after receiving the notice described above, fails to correct the conditions of which complaint is made, the Department will, upon written certificate from Engineer of the fact of such delay, neglect, or default and Contractor's failure to correct such conditions, have full power and authority, without violating the Contract, to take the prosecution of the work out of the hands of Contractor and to declare Contractor in default.

c. If Contractor, after having received a prior notice described above for any reason stated in subparagraph a. 2), 3), 4), 5), 6) or 8), commits a second or subsequent act of default for any reason covered by the same subparagraph a. 2), 3), 4), 5), 6) or 8) as stated in the prior notice, and regardless whether the specific reason is the same, then, regardless of whether Contractor has cured the deficiency stated in that prior notice, the Department will, upon written certificate from Engineer of the fact of such delay, neglect or default and Contractor's failure to correct such conditions, have full power and authority, without any prior written notice to Contractor and without violating the Contract, to take the prosecution of the work out of the hands of Contractor and to declare Contractor in default.

d. Regarding subparagraph a. 9), if Contractor fails to comply with Engineer's written suspension of work order within the time allowed for compliance and which time is stated in that suspension of work order, the Department will, upon written certificate from Engineer of the fact of such delay and Contractor's failure to correct that condition, have full power and authority, without violating the Contract, to immediately take the prosecution of the work out of the hands of Contractor and to declare Contractor in default.

e. The Department has no liability for anticipated profits for unfinished work on a Contract that the Department has determined to be in default.

2. Completion of Work by Department:

a. Upon declaration of default, the Department will have full power to appropriate or use any or all suitable and acceptable materials and equipment on the site and may enter into an agreement with others to complete the work under the Contract, or may use other methods to complete the work in an acceptable manner. The Department will charge all costs that the Department incurs because of Contractor's default, including the costs of completing the work under the Contract, against Contractor. If the Department incurs such costs in an amount that is less than the sum that would have been payable under the Contract had the defaulting Contractor completed the work then the Department will pay the difference to the defaulting Contractor. If the Department incurs such costs in an amount that exceeds the sum that would have been payable under the Contract, then Contractor and the surety shall be liable and shall pay the County the amount of the excess.

b. If, after the ten day notice period and prior to any action by the Department to otherwise complete the work under the Contract, Contractor establishes his intent to prosecute the work in accordance with the Department's requirements, then the Department may allow Contractor to resume the work, in which case the Department will deduct from any monies due or that may become due under the Contract, any costs to the County incurred by the delay, or from any reason attributable to the delay.

3. Termination of Contract for Convenience:

a. The Department may terminate the entire Contract or any portion thereof, if the Department determines termination is in the County's interest. Engineer will deliver to Contractor a Written Notice of Termination specifying the extent of termination and the effective date.

b. When the Department terminates the entire Contract, or any portion thereof, before Contractor completes all items of work in the Contract, the Department will make payment for the actual number of units or items of work that Contractor has completed, at the Contract unit price, and as approved by Engineer for items of work partially completed, and such payments will constitute full and complete compensation for such work or items. No payment of any kind or amount will be made for items of work not started. The Department will not consider any claim for loss of anticipated profits, or overhead of any kind (including home office and jobsite overhead or other indirect impacts).

c. The Department will consider reimbursing Contractor for actual cost of mobilization (when not otherwise included in the Contract) including moving equipment to the job where the volume of the work that Contractor has completed is de minimis and thereby too small to compensate Contractor for these expenses under the Contract unit prices.

d. The Department may purchase at actual cost acceptable materials and supplies procured for the work, that the Department has inspected, tested, and approved and that Contractor has not incorporated in the work. Submit the proof of actual cost, as shown by receipted bills and actual cost records, at such points of delivery as Engineer may designate.

e. Termination of a contract or a portion thereof, under the provisions of this Subarticle, does not relieve Contractor or the surety of its responsibilities for the completed portion of the Contract or its obligations for and concerning any just claims arising out of the work performed.

M. Release of Contractor's Responsibility

a. The Department considers the Contract complete when Contractor has completed all work and requirements of the Contract and the Department has accepted the Work. The Department will then release Contractor from further obligation except as set forth in the Contract Bonds, and except as allowed by the Contract Documents subsequent to Final Payment.

1.07 MEASUREMENT AND PAYMENT

A. Compensation

1. Compensation provided by the Contract, through the various scheduled items having awarded Contract Unit Prices, constitutes full payment for completing the Work and meeting all requirements of the Contract Documents. Approved payments will be made only under items having awarded Contract Unit Prices that are measured and accepted by Engineer.

2. The aforementioned compensation includes:

a. Full payment for furnishing any material, supply, equipment, tool, labor, supervision, or meeting any requirement that is reasonably inferred or incidental to the Work whether or not specifically called for by the Contract Documents.

b. Items of work that do not have awarded Contract Unit Prices, even if the items appear within the Articles of these Specifications or anywhere else in the Contract Documents. These items will not be measured separately for payment. Compensation for performing any work or meeting any requirement associated with these items is included in approved payments made under the various scheduled items having awarded Contract Unit Prices.

3. Miami-Dade County offers a payment option that will expedite County payments to your organization via Automatic Clearing House transfers instead of the issuance and mailing of a County check. More information is available at http://www.miamidade.gov/finance/vendor-payment.asp#5 The form can also be found on the Appendices to the Special Provisions

B. Contingency Allowance Account

1. A Contingency Allowance account has been established for the Work under this Contract. The Total Contract award amount will include no more than ten percent (10%) Contingency Allowance Account. Contractor is not entitled to funds from the Contingency Allowance Account unless, at the discretion of Engineer, work is directed to be performed that is beyond the scope of established pay items. Contractor shall perform such work only upon receipt of an executed Miami-Dade-County Contingency Allowance Account expenditure form from Engineer.

C. Retainage; Punch List Requirements

1. Amount of retainage.

a. An amount of 10-percent retainage will be withheld from each progress payment made to Contractor.

b. After "50-percent completion" of the Contract work, the amount of retainage withheld from each subsequent progress payment will be reduced to 5-percent.

c. For the purpose of this Article, "50-percent completion" shall mean the point at which the County has expended 50 percent of the total awarded amount of the Contract together with all costs, if any, associated with existing change orders and any other changes or additions or modifications to the construction services required by the Contract.

2. Project closeout (Punch List).

a. Within 21 days of reaching Substantial Completion and performance of required inspection(s), Engineer, with cooperation of Contractor, will develop a single punch list subject to the provisions of Section 218.735 (7) of the Florida Statutes (F.S.), listing all items necessary to render complete, satisfactory, and acceptable to Engineer all work and requirements of the Contract. Contractor will review and comment as necessary to assist Engineer in the preparation of the final draft of the list during the aforementioned timeframe.

b. Engineer will provide Contractor with the Punch List within 5 days after the List has been developed and reviewed as provided in Subarticle 2.a above. Contractor must immediately work on completion of the items listed and provide to Engineer within 5 days of receipt of the Punch List, a final schedule for the

completion of all pending work and requirements of the Contract. The schedule must provide for the final completion of all Contract requirements and acceptance by the Engineer prior to the expiration of the Contract.

c. For work order or multiphase projects:

1) Provide a punch list listing all items necessary to render complete, satisfactory, and acceptable to Engineer all work and requirements for each phase or work order as applicable.

2) All time limitations and requirements stipulated above apply except that the timeframe requirements for the individual punch lists are based on the specific phase or work order's substantial completion.

3. Release of Retainage.

a. The release of retainage is subject to Section 218.735 (7), F.S. and may be requested as follows:

1) After "50-percent completion" of the Contract work, Contractor may present to the County a payment request for up to one-half of the retainage held by the County.

2) Upon completion of all items on the punch list and their acceptance by Engineer, Contractor may submit a payment request for all remaining retainage withheld by the County under this Contract. If a good faith dispute exists as to whether one or more items identified on the Punch List have been completed pursuant to the Contract requirements, the County may continue to withhold an amount equal to 150 percent of the total costs to complete such items.

3) The County is not required to pay or release any amounts of retainage that are the subject of a good faith dispute, the subject of a claim brought pursuant to Section 255.05, F.S., or otherwise the subject of a claim or demand by the County or Contractor.

D. Deleted Work

1. The Department will have the right to cancel the portions of the Contract relating to the construction of any acceptable item therein, by the payment to Contractor of a fair and equitable amount covering all items of cost incurred prior to the date that Engineer cancels the work.

E. Partial Payment

1. Certification of Payment to Subcontractors:

2. The term "subcontractor," as used herein, includes persons or firms furnishing materials or equipment incorporated into the work or stockpiled for which the Department has made partial payment and firms working under equipment-rental agreements. Contractor is required to pay all subcontractors for satisfactory performance of their Contracts before the Department will make a further progress (partial) payment. Contractor shall also return all retainage withheld to the subcontractors within 30 days after the subcontractor's work is satisfactorily complete, as determined by the Department. Prior to receipt of any progress (partial) payment, Contractor shall certify that all subcontractors having an interest in the Contract were paid for satisfactory performance of their contracts and that the retainage is returned to subcontractors within 30 days after satisfactory completion of the subcontractor's work. Provide this certification in the form designated by the Department.

3. Within 30 days of Contractor's receipt of the final progress payment or any other payments thereafter, except the final payment, Contractor shall pay all subcontractors and suppliers having an interest in the Contract for all work completed and materials furnished. The Department will honor an exception to the above when Contractor demonstrates good cause for not making any required payment and furnishes written notification of any such good cause to both the Department and the affected subcontractors or suppliers within said 30 day period.

F. Record of Construction Materials

1. General: For all construction materials used in the construction of the Project, (except materials for materially generally classed as non-commercial), preserve for the Department's inspection the invoices and records of the materials for a period of five years from the date of completion of the Project. Apply this requirement when subcontractors purchase materials, and obtain the invoices and other materials records from the subcontractors. By providing the materials, Contractor certifies that all invoices will be maintained for the required period.

G. Recovery Rights, Subsequent to Final Payment

1. The Department reserves the right, if it discovers an error in the partial or final payments, or if it discovers that Contractor performed defective work or used defective materials, after the final payment has been made, to claim and recover from Contractor or his surety, or both, by process of law, such sums as may be sufficient to correct the error or make good the defects in the work and materials.

2. Retain all records pertaining to the Project for a period of five years from the date of Engineer's final acceptance of the Project and final payment, or greater if required by record retention laws. Upon request, make all such records available to the Department or its representative. For the purpose of this Article, records include all books of account, supporting documents, and papers that the Department deems necessary to ensure compliance with the Contract provisions.

Exhibit 2

Traffic Control Equipment Standards and Specifications
Section 600 (General Provisions for Traffic Control Devices)

SECTION 600
GENERAL PROVISIONS FOR TRAFFIC CONTROL DEVICES

PART 1 GENERAL

1.01 DESCRIPTION

A. These Provisions are in addition to all applicable requirements of Division 01 (General Requirements) of the DTPW Specifications and supplement the Miami-Dade County Traffic Control Equipment Standards and Specifications and all other governing standards, requirements, and specifications.

B. All work associated with the installation, modification or repairs of traffic control devices owned, operated or maintained by Miami-Dade County must conform to the requirements of these Provisions and the current requirements of the References listed below. The Engineer of Record and the Contractor performing the work are responsible for complying with all applicable requirements.

1.02 REFERENCES

A. Miami-Dade County Traffic Control Equipment Standards and Specifications including Division 01 (General Requirements)

B. FDOT Approved Product List (APL)

C. Miami-Dade County Traffic Signals and Signs Division's Qualified Products List (TSSQPL)

D. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (Divisions II & III), Special Provisions and Supplemental Specifications

E. FHWA Manual on Uniform Traffic Control Devices (MUTCD)

F. National Electrical Code, NFPA 70 (NEC)

1.03 DEFINITIONS

A. Engineer, defined in Subarticle 1.01.D of Division 01 (General Requirements) Miami-Dade County DTPW Specifications, includes the duly authorized representatives of the DTPW Traffic Signals and Signs (TSS) Division. Wherever these Provisions require either notification to or action by Engineer, it is understood to include the DTPW TSS Division authorized representative in addition to any other duly authorized DTPW representatives designated for the specific project.

1.04 REGULATORY REQUIREMENTS

A. Permits.

1. DTPW Permit(s) and written authorization from the DTPW Traffic Signals and Signs (TSS) Division are required before proceeding with any work pertaining to or that may potentially affect the Miami-Dade County Traffic Control System. Additional requirements regarding the performance and acceptance of the Work may be stipulated by the DTPW TSS Division.

B. Notification.

1. Provide written and verbal notification to the DTPW TSS Division:
   a. Ten business days prior to commencement of any construction, modification or repair of any component within the Miami-Dade County traffic control system.
   b. Five business days prior to the commencement of jobs that include overhead or underground work conducted as part of construction or maintenance projects within Miami-Dade County roadways or other roadways within the County whose traffic control devices are maintained by Miami-Dade County.
2. Notification is provided at:

   Department of Transportation and Public Works
   Traffic Signals and Signs Division (Attn: WRITTEN NOTIFICATION)
   7100 NW 36th Street
   Miami, FL 33166

   Phone: 305-679-0041

3. Provide immediate verbal notice followed by written notification to the DTPW TSS Division upon the discovery of any damage, malfunctions, or irregularities pertaining to any Miami-Dade County Traffic Control System component.

C. Preliminary Product and Equipment Data Submittals.

1. Prior to installation or within thirty days after the preconstruction conference, whichever comes first, submit to Engineer for approval:
   a. A completed “Submittal Data – Traffic Control Equipment” form listing, by FDOT APL numbers, all traffic control signals, devices, and hardware that will be used on the Project. Only current FDOT APL certified items that have also been approved and currently listed in the TSSQPL may be used.
   b. One copy of the manufacturer’s descriptive literature and technical data fully describing proposed non-structural equipment or material whose category or type does not require FDOT APL certification or TSSQPL approval.
   c. Two copies of the shop drawings signed and sealed by the Specialty Engineer. Shop drawings are required for all structural support materials and other special designs, such as non-electrical, non-mechanical, or other fabricated items, which may not be specifically detailed in the Plans.

D. Transfer of Maintenance Responsibilities.

1. Fully maintain all traffic control devices located within the Project limits, including any interconnect, beginning on the date of the Notice to Proceed or the date Contractor has begun any work on any portion of the Project, whichever is sooner, through and including the date of Final Acceptance by the County subject to any additional Contractor Warranty and Burn-in Period requirements. Investigate all inquiries, complaints or requests made by the County or the Public and immediately initiate all required repairs.
2. Notify Engineer of intent to begin any physical construction work on the Project or any portion thereof. This notification must be a minimum of seven (7) working days prior to the start of construction to allow sufficient time for Contractor to conduct an inspection of the existing traffic control device installation(s). In the event any deficiencies are

noted by Contractor, at the County's option, they are to be repaired by the TSS Division or documented on the "Transfer of Maintenance" form. If work is started prior to the inspection, maintenance of the traffic control device(s) will immediately be transferred to Contractor without an inspection. Contractor is then responsible for repairing or replacing all equipment that is not operating properly or is damaged at no cost to the owner of the traffic control device.

3. For new traffic control devices, partial or final acceptance and inspection must be scheduled with the County Project Manager before the traffic control device is placed in normal operational mode. Notification is also required before placing the signal in the flashing mode.

E. Emergency and Non-Emergency Repairs

1. Provide Engineer two (2) contact names and (24-hour) telephone numbers. Contractor must provide sufficient qualified personnel to respond to all notifications of malfunctions on a round-the-clock basis (24 hours a day, 7 days a week).
2. Maintain and make available to Engineer a time and date log of each response from the time of the initial report to the time of final permanent repair.
3. When a signal malfunction occurs, Contractor must respond within two hours of notification and repair the traffic signal so that it is operating in a safe manner within four hours of initial notification. Contractor is responsible for the permanent repair within 24 hours, and must notify the County immediately upon completion of the repairs. If Contractor fails to respond within two hours, the County reserves the right to either repair the malfunction or employ alternate personnel and charge all costs incurred by the County to the Contractor.
4. Authorized County personnel may, at any time, enter the controller cabinet in order to modify timing or restore any and all signal equipment to proper operation if the malfunction or non-function of such equipment poses a hazard or inconvenience to motorists or pedestrians. Such authorized entry may occur at any time within the period of the contract, and such authorized entry will in no way relieve the Contractor or manufacturer of their respective warranties.
5. Emergency Repairs
    a. During the Transfer of Maintenance period, the following will be considered an Emergency unless otherwise identified by Engineer:
        1) Any hazardous condition;
        2) Any malfunction of a controller and its accessory equipment; or
        3) Any Site condition, equipment malfunctions or damage, which in the opinion of Engineer constitutes a serious hazard or inconvenience to the public.
    b. Contractor must dispatch personnel to undertake each such repair no later than thirty (30) minutes after the County notifies Contractor of the Emergency. Personnel responding must arrive within one hour after notification and immediately proceed to make the site safe.

1.05 LICENSES AND QUALIFICATIONS

A. Qualifications

1. Contractor license requirement.
    a. Contractor must hold either a Miami-Dade County Electrical Contractor License or a State of Florida Certified Electrical Contractor License, or both.

2. Minimum qualifications for personnel supervising or performing work involving electrical Traffic Control Devices and related components or appurtenances.

   a. All work must be performed under the direction of an employee of the Contractor who is a licensed Miami-Dade County Master Electrician, is present at the job site or able to respond within 2 hours of notification, and holds a current International Municipal Signal Association (IMSA) Traffic Signal Field Technician Level II certification or higher. The Master electrician is required to attest to the quality and accuracy of the Work and its compliance with all applicable codes, standards and specifications; and when required by Miami-Dade County, perform a final verification inspection of the Work.

   b. Minimum qualification requirements for personnel at the job site:

Work Performed	Qualification Requirements
Contractor's Superintendent	1. Must meet all applicable FDOT and DTPW requirements for a work site superintendent and be at the job site at all times that work is being performed; 2. Must hold a current IMSA Traffic Signal Construction Technician Level II certification or higher; and 3. Must be present at the final inspection of the Work as directed by Miami-Dade County.
All controller cabinet work including back panel wiring terminations; programming; testing; turn on; and troubleshooting.	1. Work must be performed by an employee of the Contractor that is a licensed Miami-Dade County Journeyman Electrician and that holds a current IMSA Traffic Signal Field Technician Level II certification or higher; and 2. Must be present at the final inspection of the Work as directed by Miami-Dade County.
Electrical traffic control device work including cable and wire installation and splices; signal head installation; power service installation; ground rod testing; cable and wire testing; and field wiring terminations.	1. Work must be performed by or in the presence of and under the responsible charge of an employee of the Contractor that is a licensed Miami-Dade County Journeyman Electrician and that holds a current IMSA Traffic Signal Field Technician Level II certification or higher; and 2. Must be present at the final inspection of the Work as directed by Miami-Dade County.
Supervision of work that is non-electrical in nature and exclusively ancillary to the work described herein	1. Must be performed by an employee of the Contractor that holds a current IMSA Traffic Signal Field Technician Level I certification or higher.

3. Training and Certifications for Temporary Traffic Control

   a. The following certifications from FDOT approved providers are required:

      1) Contractor's designated Worksite Traffic Supervisor must have a current FDOT MOT Advanced certification. Contractor's IMSA Traffic Signal Construction Technicians and Traffic Signal Field Technicians described in Paragraph "A.2" above, including the licensed Journeyman and Master

electricians, must have a current FDOT MOT Intermediate certification or higher.

2) Contractor's designated Flaggers must have a current FDOT MOT Basic certification.

4. Provide to the DTPW TSS Division for review and approval an updated list of names of all personnel assigned to perform the work along with current copies of their required licenses and certification cards, before starting any work. In addition, ensure that these personnel have copies of their licenses and certifications available at the work site and ready to make them available to DTPW personnel if requested.

B. Qualified Technical Representative of the Control Equipment Manufacturer.

1. A qualified technical representative of the control equipment manufacturer is required to be present at the work site to assist in checking out the operation of the controller whenever:

   a. A Contractor-furnished traffic signal controller is turned on; or
   b. An existing Signal is revised requiring Contractor furnished control equipment.

1.06 ACCEPTANCE OF TRAFFIC CONTROL SIGNAL AND DEVICE INSTALLATIONS.

A. Engineer will make inspection for final acceptance of traffic control signal and device installations as part of all work only after satisfactory completion of all field tests of completed installations and on the basis of a comprehensive final field inspection of all equipment installations.

B. Submit three copies of a completed Submittal Data – Traffic Control Equipment form for each cabinet location, to Engineer. Engineer will place one copy in the cabinet at each location.

C. Transfer warranties and guarantees on equipment to the Department in accordance with this Section.

D. For traffic signal installations, submit three completed copies of the Final Acceptance of Traffic Signal Installation(s) and Transfer of Maintenance form.

E. Documentation for Electronic Equipment.

1. Required Documentary Items.

   a. Operation Manual
   b. Troubleshooting and Service Manual
   c. Assembly and installation instructions
   d. Pictorial layout of components and schematics for circuit boards
   e. Parts list
   f. Diagram of the field installation wiring (not applicable to the detectors)
   g. Warranty information

2. Prior to final inspection, furnish Engineer with two copies of the aforementioned documentary items from the manufacturer for the following electronic equipment:

   a. Controllers
   b. Vehicle detectors
   c. Load switches

d. Flasher units
e. Preemption units
f. Conflict monitors
g. Special sequence relays
h. Cameras
i. Dynamic message signs
j. Any other equipment which has a logic, timing, or communications function
k. Other equipment specified in the Contract Documents

F. As-Built Drawings.

1. As a condition precedent to acceptance, provide signed and sealed As-Built Drawings, either by a State of Florida licensed professional engineer or a professional surveyor and mapper, and prepared pursuant to Subarticle 1.06.I of Division 01 (General Requirements) of the DTPW Specifications. These drawings must show the actual location of all signal poles, mast arms, traffic control devices, signs, cabinets, service points and must clearly depict all installations including the depth and location of all conduits and conductors; and the specific product number installed.
2. Submittal Requirements:
   a. Submit three sets of as-built plans for review by Engineer along with electronic copies consisting of a separate level/layer within the project design files. Coordinate the format of electronic as-built files with Engineer. Record all as-built information using typed text to ensure legibility.
   b. The As-Built plans shall be neat, legible and of the correct size. Bridge projects and any road projects which include Plan, Profile and Cross-Section Sheets must be full size (22” X 36”). In general, if the job was let with full size plans, the As-Builts must be full size. All revisions to the original plans must be delineated in red, located properly on the drawing, they must be legible and true to scale. Every As-Built Plan, Profile and Cross-section Sheet must be designated as such by note or stamp “As-Built” in black.
   c. Signing and pavement marking plan sheets may be used instead of signalization plan sheets, if a substantial number of changes from the original plans must be recorded. If, in the opinion of the Engineer, the changes cannot be clearly delineated on the existing drawings, clearly delineate all changes on 11 inch by 17 inch detail sheets, enlarged 200% from the reproductions.
   d. Submit fiber optic splicing diagrams detailing all cable splices, terminations, equipment port assignments, and optical circuits within the communication network.
   e. As-built submittals must include an electronic file with an inventory of all traffic control signals and devices, and support structures. The inventory must include horizontal position geographic coordinate data collected using Differential Global Positioning System (DGPS) equipment. The inventory must include the manufacturer, model, and serial number for each device or completed assembly. Provide coordinate data for pull boxes as well as conduit and cable at 100 foot intervals including changes in direction.
   f. Aerial photographs may be furnished with as-built submittals to provide supplementary information. The aerials should not include extra features such as the right of way, baseline, or roadway edges. The aerials may be used as a base for the as-built plans with mile post and offset dimensions. Make any corrections resulting from Engineer’s review, and resubmit three sets of the completed as-built plans as a condition precedent to acceptance of the installation.

3. Components: As a minimum, identify all traffic control devices, poles, support structures, cabinets, pull and splice boxes, hubs, access points, and power services.

    a. Conduit and Cable: Identify all conduit and cable with unique line styles for routing (overhead, conduit, saw cut, etc.) that are clearly identified in a legend on each sheet. Identify the type of cable (example - 7 conductor signal cable) and label the number of conductors, fiber strands or other identifying features of the cable. For conduit, clearly note conduit size and number of runs.

    b. Loops and Detection Zones: Identify the location of all installed loops (including the distance from the stop bar for the advance loops), the path of each loop to the pull box, the loop window and the path of the loop lead-in to the controller cabinet. Identify the device location and the approximate detection area for detection systems that are not embedded in or under pavement.

    c. Pull Boxes: Label unused and out of service pull boxes clearly. Show distances to each pull box from the nearest edgeline, stop bar, or other permanent feature. If an edgeline is not near a pull box or would not clearly identify its location; a fixed monument may be used (example - FDOT pole or structure).

    d. Poles: Identify poles from the nearest edgeline of both approaches. If an edgeline is not near a pole or would not clearly identify its location, a fixed monument may be used.

    e. Signal Heads: As-built plans must show the final location of signal heads. Each signal head shall be identified by its corresponding movement number.

    f. Cabinet: The type of cabinet, date of installation and inventory of internal components must be documented. Controller manufacturer along with the controller model number shall be provided for all traffic signal cabinets. A cabinet corner “blow up” shall be provided detailing pull box locations with all conduit and cable.

1.07 MANUFACTURERS’ WARRANTY PROVISIONS

A. General.

1. Manufacturer and Contractor costs associated with transferring, providing, and delivering equipment warranties, requirements, terms, and conditions are part of the Work and are included in the overall cost of the Work or where available, in the pay item for the equipment or construction feature utilizing the equipment.

2. Secure all warranties provided by the equipment manufacturer for the specific equipment included in the Contract. Ensure that all warranties are fully transferable from the Contractor to the owner of the equipment within the project limits. Ensure that warranties cover defects for at least the duration specified in the Contract Documents from the date of Final Acceptance in accordance with the applicable Contract Provisions.

3. Transfer warranties upon Final Acceptance. Document all warranties and warranty transfers and provide a copy to Engineer.

4. Contractor’s responsibility for warranty repairs, warranty replacement, troubleshooting, or other costs associated with repair or replacement of traffic control signals and devices within the Contract’s project limits will terminate 90 days after Final Acceptance.

B. Terms and Conditions.

1. Ensure that the terms and conditions of warranties are documented by the manufacturer for equipment submittals on construction projects. Include terms for a

specified service performance with provisions for repair parts and labor, or for replacement.

2. Ensure that warranties and guarantees are consistent with those provided as customary trade practices; or as otherwise specified in the Plans, Standard Specifications, Supplemental Specifications or Special Provisions.
3. When a warranty is available, ensure that a written warranty accompanies the manufacturer's billing invoice. Ensure warranties require the manufacturer to furnish replacements for any part or equipment found to be defective during the manufacturer's warranty period at no cost to the owner of the equipment within the project limits.
4. Ensure that manufacturer's and supplier's warranties and guarantees are transferable to the agency or user that is responsible for traffic signal maintenance, are continuous throughout their duration and state that they are subject to such transfer.
5. Ensure the manufacturer will repair any faulty equipment during this period at no charge to the Department for parts, labor or shipping to and from the factory.

PART 2 PRODUCTS

2.01 EQUIPMENT AND MATERIALS.

A. General.

1. Ensure that the traffic signal equipment, materials, and work meet the requirements of the Plans and Specifications. All equipment furnished must be new and meet the requirements of the following:
   a. Underwriter's Laboratory Incorporated (UL)
   b. Electronic Industries Association (EIA)
   c. National Electric Code (NEC)
   d. American Society of Testing and Materials (ASTM)
   e. American National Standards Institute (ANSI)
   f. International Municipal Signal Association (IMSA)
   g. National Electrical Manufacturers Association (NEMA)
2. Use only compatible units of any one item of equipment, such as signal heads, detectors, controllers, cabinets, poles, signal system or interconnection equipment, etc.
3. Use only new equipment and material.
4. Provide a complete operable signal installation as specified regardless of any failure of the Department to discover or note any unsatisfactory material.
5. Traffic control signals and devices must be currently approved and listed on the FDOT APL and the DTPW TSSQPL. Contractor may seek acceptance and inclusion of new traffic control signals and devices in the TSSQPL however; doing so will not exempt Contractor from meeting all requirements of the Contract Documents including timely prosecution of the Work.

B. Hardware and Fittings Used for Installation.

1. Ensure that all assembly hardware, including nuts, bolts, external screws and locking washers less than 5/8 inch in diameter, are Type 304 or 316 passivated stainless steel. Use stainless steel bolts, screws and studs meeting the requirements of ASTM F593. Use nuts meeting the requirements of ASTM F594. Ensure all assembly hardware greater than or equal to 5/8 inch in diameter is galvanized. Use bolts, studs, and threaded rod meeting the requirements of ASTM A307. Use structural bolts meeting the requirements of ASTM A325.
2. Use high-strength steel anchor bolts and U-bolts, having a minimum yield strength of 55,000 psi and a minimum ultimate strength of 90,000 psi.

C. Galvanizing: Meet the requirements of FDOT Section 962 when galvanizing for fittings and appurtenances for all structural steel (including steel poles).

D. Environmental Specifications: Ensure system electronics intended for installation outdoors or within a roadside cabinet perform all required functions during and after being subjected to the environmental testing described in National Electrical Manufacturers Association (NEMA) TS2, 2.2.7, 2.2.8, and 2.2.9.

2.02 DEPARTMENT-FURNISHED EQUIPMENT INSTALLED BY CONTRACTOR.

A. Where the Contract Documents require installation of Department-furnished equipment, the Department will turn over such equipment to Contractor when the construction progress allows or as designated in the Contract Documents.

B. The Department will test and certify the equipment to be in proper condition and ready to use and will bear the costs of correcting any defects in the equipment prior to pick-up by Contractor. Engineer will coordinate the pick-up and installation of the equipment.

C. Maintain the equipment in proper operational condition after pick-up at no cost to the Department, until either Final Acceptance or the equipment is returned to the Department.

PART 3 EXECUTION (NOT USED)

END OF SECTION 600

Exhibit 3

Traffic Control Equipment Standards and Specifications
Section 630 (Conduit)

SECTION 630
CONDUIT

PART 1 GENERAL

1.01 SUMMARY

A. Description

1. Furnish and install conduit for traffic control signals and devices, and other electrically powered or operated devices as shown in the Contract Documents.

B. Method of Measurement

1. Furnish and Install:

a. The Contract unit price per foot of conduit, furnished and installed, will include furnishing all hardware and materials and all testing as specified in this Section and the Contract Documents, and all labor, casings, removal of excavated materials and spoils, removal and disposal of drilling fluids, locate wire, trenching, boring, backfilling, flowable fill and restoration materials necessary for a complete and accepted installation.

b. Payment for conduit placed underground will be based on the horizontal length of the trench or bore measured in a straight line between the centers of pull boxes, cabinets, poles, etc., in linear feet, regardless of the length or number of conduits installed. No allowance will be made for sweeps or vertical distances below the ground.

c. Payment for conduit placed aboveground or bridge mounted will be based on the actual length of conduit installed.

C. Basis of Payment

1. Price and payment will be full compensation for all work specified in this Section.

2. Payment for conduit placed under existing turf will be made as open trench.

3. Payment for conduit placed under existing pavement (roadway, driveways, or sidewalk) will be made as directional bore. If conduit is being placed under both existing turf and existing pavement between two pull boxes, payment for the total pull box-to-pull box length will be made as directional bore. Payment for conduit placed by jack & bore will be made as jack & bore, for the total pull box to pull box length.

4. No additional payment will be made for multiple conduits in the same trench.

5. No payment adjustment will be made if Contractor chooses to use an alternative method approved by Engineer.

6. No payment will be made for failed bore paths, injection of excavatable flowable fill, products taken out of service, or incomplete installations.

7. Payment will be made under:

Item No.	Description	Unit
630-2-11	Conduit, F&I, Open Trench	LF
630-2-12	Conduit, F&I, Directional Bore	LF

1.02 REFERENCES

A. Miami-Dade County Traffic Signals and Signs Division's Qualified Product List (TSSQPL)

B. FDOT Approved Product List (APL)

C. American Society for Testing and Materials (ASTM)

D. American Nation Standards Institute (ANSI)

E. National Electric Code (NEC)

F. National Electrical Safety Code (NESC)

PART 2 PRODUCTS

2.01 MATERIALS

A. Conduit.

1. Use materials that have been tested and listed by a Nationally Recognized Testing Laboratory to the following industry standards:

   a. Schedule 40 and 80 Polyvinyl Chloride (PVC)[1] ..... UL 651
   b. Fiberglass Reinforced Epoxy[2] ..... UL 2420
   c. Rigid Galvanized Metal[3,4] ..... UL 6
   d. Rigid Aluminum[4] ..... UL 6A
   e. PVC Coated Intermediate Metal[4] ..... ASTM: A135/A135M, ASTM A513, ... ASTM A568/A568M; NEMA RN1-2005
   f. Liquid Tight Flexible Metal ..... UL 360
   g. HDPE SDR 9-11[5] ..... ASTM F2160
   h. HDPE SDR 13.5[5] ..... ASTM F2160, NEMA TC-7
   i. Schedule 40 and 80 HDPE ..... UL 651A

   [1]Use conduit with solvent weld slip-fit plastic couplings unless approved by the Engineer.

   [2]Use conduit having a minimum stiffness value of 250. Ensure that each section has a duct bell with an integral gasket on one end and a duct spigot on the other end.

   [3]Use conduit that is hot-dipped galvanized with a minimum coating of 1.24 ounces per square foot on both the inside and outside of the conduit. The weight of the zinc coating shall be determined using ASTM A90.

   [4]Use conduit with both ends reamed and threaded.

   [5]Can be used with preassembled cable and rope-in-conduit.

B. Locate Wire

1. Ensure that locate wire is a single copper conductor with a minimum gauge of No. 12 AWG. Ensure locate wire is insulated using a 45 mil minimum thickness polyethylene sheath that is orange in color and marked to identify the manufacturer and the conductor size.

C. Locate Wire Grounding Unit

1. Ensure that locate wires are attached to a wire grounding unit (WGU) dedicated to safely dissipate high transient voltages or other foreign electrical surges induced into the designated system. Ensure the WGU conforms to the following:
   a. Allows signals generated by locate system transmitters to pass through the protection system without going to ground.
   b. The protection system automatically resets and passes locate system transmitter signals after the unit has been grounded to dissipate over-voltages.
   c. Is intended for below or above grade applications. Ground the WGU to a driven rod within 10 feet of the system using a No. 6 AWG single conductor wire with green insulation. Ensure that the WGU is enclosed for protection from environmental hazards and is accessible for the connection of portable locate system transmitters.
   d. The WGU system meets the minimum standards listed in Table 1 for surge protection:

Table 1: Minimum Standards for Surge Protection	
Surge Element	3-element maximum duty fail-safe gas tube.
Rating	40,000 A surge capacity (single-cycle, 8 by 20 microsecond waveform).
Life	Minimum 1,000 surges (1000 A to ground).
Fail-Safe	Integral fail-shorted device.
Insulation Resistance	1,000 megohm minimum at 100 volts of direct current (VDC).
Clamp Voltages	a. Impulse at 100 volts per microsecond: Typically 500 volts. b. Direct Current: 300 to 500 volts.

D. Warning Tape

1. Ensure that the buried cable warning tape is flexible, elastic material 3 inches wide, 6 mil thick, intended for burial and use as an underground utility warning notice, and that the surface of the warning tape is coated and sealed to prevent deterioration caused by harsh soil elements. Ensure that the warning tape color follows the American Public Works Association color code for underground utilities and has the repeating message “CAUTION: MDC TRAFFIC CABLE,” or other wording approved by the Engineer, permanently printed on its surface. Ensure that the tape material and ink colors do not change when exposed to acids, alkalis, and other destructive chemical variances commonly found in Florida soils.

E. Route Markers

1. Route markers may be either a standard route marker (SRM) type or an electronic route marker (ERM) type. Ensure the SRM is a rigid, tubular, driven post used for location and notification purposes only. Ensure the ERM is physically identical to the SRM, but also includes a termination board to provide aboveground access to locate wire buried alongside conduit and cable runs.
2. Ensure that each SRM is labeled and identified as a MDC Traffic fiber optic cable marker unless otherwise shown in the Plans. The labels must include the County's logo, contact information for the DTPW TSS Division, and a telephone number to call prior to any excavation in the area. Ensure that the identification information is permanently imprinted on the top fitting, and will not peel, fade, or deteriorate.

F. Standard Route Marker (SRM)

1. Ensure that SRM posts are white with an orange top fitting cover with black or white lettering and graphics. Ensure that the SRM is a tubular configuration, and both the marker post and the top fitting are made from virgin Type 111 HDPE. Ensure that any fasteners used with the SRM are constructed of stainless steel.
2. Ensure that all SRMs have a minimum outside diameter of 3.5 inches with a minimum wall thickness of 0.125 inches. Ensure that the top fitting cover is a minimum of 1.5 feet long and has an outside diameter of 3.75 inches with a minimum wall thickness of 0.125 inches. Ensure that each SRM provides a tensile strength of 4,200 pounds per square inch as required in ASTM D638. Ensure that each SRM is manufactured for use in temperatures range of minus 30° to 165°F in accordance with NEMA TS 2.
3. Ensure the SRM can withstand an impact force of 70 pounds per foot at 32°F in accordance with ASTM D2444, before and after UV conditioning for 2,000 hours in accordance with ASTM G154. Ensure that the control sample of any material tested maintains a minimum of 70 percent of its original tensile strength.
4. Ensure that SRMs installed at the minimum 2 foot depth can withstand at least one impact at 45 miles per hour by a vehicle weighing at least 3,500 pounds and that after impact, post returns to an upright position within 10 degrees of vertical alignment within 30 seconds from the time of impact.

G. Electronic Route Marker (ERM)

1. Ensure ERMs meet the same material and performance requirements as the SRMs with the following exceptions.
   a. Equip each ERM with a removable, top-fitting cover that is black with white lettering.
   b. Ensure that each ERM contains a terminal board equipped with locate wire and ground connectors.
   c. Ensure that the terminal board is made from corrosion-resistant materials and includes terminal facilities labeled according to function and provides uniform spacing between connection points.

PART 3 EXECUTION

3.01 INSTALLATION

A. Conduit Installation Requirements

1. Install the conduit in accordance with NEC or National Electrical Safety Code (NESC) requirements and the Design Standards. Consider the locations of conduit as shown in the Plans as approximate. Construct conduit runs as straight as possible, and obtain Engineer's approval for all major deviations in conduit locations from those shown in the Plans. Include buried cable warning tape with all trenched conduit. Mark the location of the conduit system with route markers as shown in the Plans and approved by Engineer. Ensure that all route markers used are new and consistent in appearance.
2. For conduit installed by directional bore, install in accordance with FDOT Specification Section 555. For conduit installed by jack and bore, install in accordance with FDOT Specification Section 556.
3. Use only rigid galvanized metal conduit, or rigid aluminum conduit for above-ground and underground electrical power service installations. Meet the requirements of FDOT Specification Section 562 for coating all field cut and threaded galvanized pipe.
4. Use Schedule 80 PVC or fiberglass reinforced epoxy conduit in structural elements in or on bridge decks.
5. Use HDPE with an SDR number less than or equal to 11, Schedule 80 PVC or Schedule 40 PVC for underground installations in earth or concrete for ITS and traffic control signal applications, except, use only HDPE with an SDR number less than or equal to 11 for blown fiber optic cable installations on limited access facilities.
6. Use HDPE with an SDR number less than or equal to 13.5, Schedule 80 PVC, or Schedule 40 PVC for underground installations of electrical conduit in earth for lighting applications and landscape irrigation applications.
7. Use HDPE with an SDR number less than or equal to 13.5, Schedule 80 PVC, Schedule 40 PVC, or rigid galvanized metal for underground installations of electrical conduit in concrete for lighting applications.
8. Do not place more than the equivalent of three quarter bends or 270 degrees of bends, including the termination bends, between the two points of termination in the conduit, without a pull box. Obtain Engineer's approval to use corrugated flexible conduits for short runs of 6 feet or less.
9. When a conduit installation changes from underground to above-ground, make the change a minimum of 6 inches below finished grade.
10. Install a No. 12 AWG pull wire or polypropylene cord inside the full length of all conduits. Ensure that a minimum of 24 inches of pull wire/cord is accessible at each conduit termination.
11. Ensure the conduit includes all required fittings and incidentals necessary to construct a complete installation.
12. When earth backfill and tamping is required, place backfill material as per FDOT Section 120 in layers approximately 12 inches thick, and tamp each layer to a density equal to or greater than the adjacent soil.
13. When backfilling trenches in existing pavement, use a flowable fill meeting the requirements of FDOT Specification Section 121.
14. Provide a standard clearance between underground control cable and electrical service cable or another parallel underground electrical service cable that meets NESC requirements.
15. Prevent the ingress of water, dirt, sand, and other foreign materials into the conduit prior to, during, and after construction. Seal the ends of conduit after wiring is complete with a moisture resistant sealant that is designed for this specific application.

B. Fiber Optic Cable Conduit

1. Install the conduit system so the fiber optic cable maintains a minimum bend radius of 20 times the cable diameter. Use approved methods for connecting inner duct or conduit within or between plowed portions, trenched portions, and bored portions. Submit the conduit manufacturer's coupling method and material to Engineer for approval.

C. Conduit Sizes

1. Size the conduit to be used on all installations, unless otherwise shown in the Contract Documents. Use conduit of sufficient size to allow the conductor to be installed without any damage and meeting NEC requirements. Use conduit that is at least 2 inches in diameter, with the following exceptions:
   a. For conduit protecting the ground wire on the side of a pole, use conduit that is at least 1/2 inch in diameter.
   b. For ITS applications where Contractor chooses to install fiber optic cable by blowing, use conduit that is at least 1-1/4 inch in diameter.
   c. For traffic control signal and device electrical service conduit, use the minimum conduit size required by the Department and the electrical service provider.
   d. Where larger size conduits are required by the Miami-Dade County Traffic Control Equipment Standards and Specifications.

D. Conduit Joints

1. Make conduit joints using materials as specified by the manufacturer. When conduit crosses an expansion joint of a structure and where shown in the Plans, install an expansion or expansion/deflection fitting as specified by the manufacturer. Certify that expansion/deflection fittings are rated to accommodate a minimum rotation of 30 degrees and that both the expansion and expansion/deflection fittings are rated to accommodate the anticipated longitudinal movement (minimum of 2 inches for deflection fittings and 0.7 inches for expansion/deflection fittings). Ensure that all installed joints are waterproof. As an exception to the threaded coupling for intermediate metal conduit, at locations where it is not possible to screw the threaded coupling properly, Contractor may use a waterproof slip-joint coupling approved by Engineer. Secure the joint, and tighten threaded connections.
2. Prior to insertion into the coupling, clean, prime and coat the ends of PVC conduit with solvent-type cement as specified by the manufacturer.

E. PVC Coating

1. Apply PVC coating to exposed metal surfaces of the conduit, except for the threads, to attain a nominal thickness of 40 mils. Ensure that the coating is free of sags and drips.
   a. Attach the coupling to the conduit prior to the application of the coating for conduit of 1 inch diameter or less.
   b. Use a coupling with sleeve extensions on conduit larger than 1 inch. Ensure that the sleeve extensions on all threaded female openings have a length equal to the diameter of the conduit up to and including size number 53.

F. Conduit Terminations

1. Fit the terminating ends of all metal conduit and metal conduit sleeves with an appropriate bushing.

2. For conduit to be encased in concrete, wrap with tape or otherwise protect all terminations to prevent the entrance of concrete.
3. Connect new underground conduits to existing underground conduits with a pull box.
4. Install conduit terminating in a concrete strain pole through the cable entry hole and up the center of the pole to a location approximately 6 inches below the handhole.
5. Seal conduits terminating in a controller base, pole, pull box, junction box, or pedestal base with a moisture resistant sealant approved by Engineer.
6. For a controller base, pole or pedestal base, and junction boxes, terminate conduit runs into the center of the base or box at least 2 inches above the surface of the base.

G. Restoration of Trench Areas

1. Restore the conduit trench construction area to an acceptable condition. Such work includes repair or replacement of all pavement areas, sidewalks, driveways, curbs, structures, landscaping, grass areas (including removal of excavated materials and spoils), removal and disposal of drilling fluids, and backfilling areas disturbed by the conduit installation.

H. Above Ground Installation

1. Use conduit designed and manufactured for use in long-term above-ground applications with UV stabilization to prevent material deterioration. Securely attach above-ground conduit installations to the surface of the supporting structure using conduit straps. As a minimum, use conduit straps located on 5 foot centers. Use galvanized metal conduit straps when installing intermediate metal conduit, fiberglass reinforced epoxy conduit, rigid galvanized conduit, rigid aluminum conduit or PVC coated intermediate metal conduit above ground.
2. Use the same PVC coating for the metal straps as the conduit, when using PVC coated intermediate metal conduit.

I. Elbows

1. The radius of curvature of the centerline of any bend shall not be less than shown below:

Size	Standard Radius
1/2 inch	4 inches
3/4 inch	4-1/2 inches
1 inch	5-1/2 inches
1-1/4 inches	7-1/4 inches
1-1/2 inches	8-1/4 inches
2 inches	9-1/2 inches
2-1/2 inches	10-1/2 inches
3 inches	13 inches
3-1/2 inches	15 inches
4 inches	16 inches

Size	Standard Radius
5 inches	24 inches
6 inches	30 inches

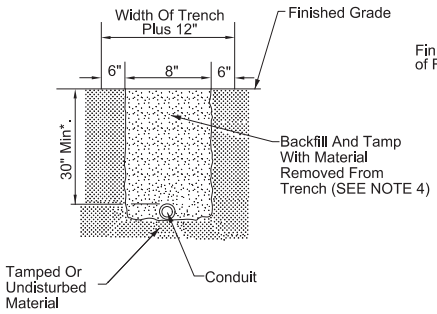
J. Fiber Optic Cable Locate Wire

1. Install locate wire in the trench or bore with all underground conduits to provide end-to-end electrical continuity for electronically locating the underground conduit system. Bury locate wire along the centerline of the top outer surface of installed conduit. Do not install locate wire in a conduit with fiber optic cable.
2. Do not run locate wires into field cabinets. Terminate locate wires at the first and last pull boxes in the conduit run or as shown in the Plans. Ensure that wire termination occurs in a pull box as shown in the Miami-Dade Conduit Installation Details (N.T.S).
3. In a trenching operation, install the locate wire no more than 3 inches above the conduit. Ensure that the locate wire enters all pull and splice boxes, and that a minimum of 10 feet of slack locate wire is coiled and neatly stored in each box.
4. In a boring operation, install the locate wire in an encasement, install the conduit detection wire external to the conduit with no separation between conduit and wire, or use conduit with integral locate wire. Locate wire may also be placed in the void between the inner wall of conduit and innerducts contained within the conduit as long as no other cables are present within the void.
5. Perform continuity tests and insulation resistance tests on all locate wires and provide Engineer with all test results. Replace, or repair defective locate wire at no additional cost.
6. Make locate wire splices in a flush grade-level box. Ensure that locate wire splices are waterproof and suitable for direct burial. Ensure that locate wire splices at the pull box meet NEC requirements. Ensure that locate wire splices are constructed of and in the following order: a mechanical crimp connection with a butt sleeve, an oxide-preventing aerosol lacquer, mastic electrical splicing tape, and standard electrical tape. At the completion of the installation, provide Engineer with as-built drawings that document all splice locations.
7. Install WGUs in pull boxes and splice boxes as shown in the Plans or directed by the Engineer. Mount the device in a location high enough from the bottom of the box to allow access to terminal facilities without disturbing cables present within the box. Terminate the locate wires and connect the WGU to ground in accordance with the manufacturer’s instructions.
8. Test the locate wire system after installation to ensure that it functions and can be used to accurately locate the conduit system.

K. Route Markers

1. Install route markers for fiber optic cable installations as detailed in FDOT Specification Section 630-3.10.

END OF SECTION 630

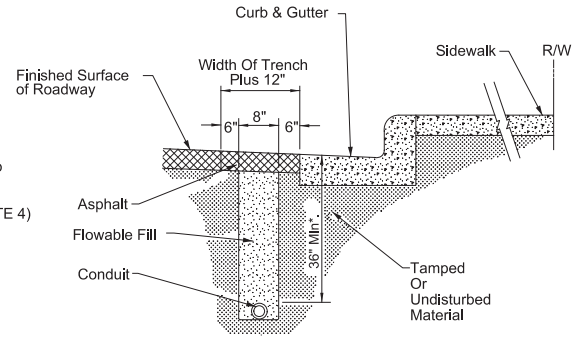


FOR USE IN AREAS NOT EXPOSED TO VEHICULAR TRAFFIC

FIGURE A

Notes:

1. Sidewalk patches to match existing joints.
2. Entire sidewalk slab must be replaced when specified in the plans.
3. Backfill and tamp with material from trench except at driveways. At driveways, backfill a length of trench within the driveway entirely with Flowable Fill.
4. Remove and replace additional pavement within 6" of tench.

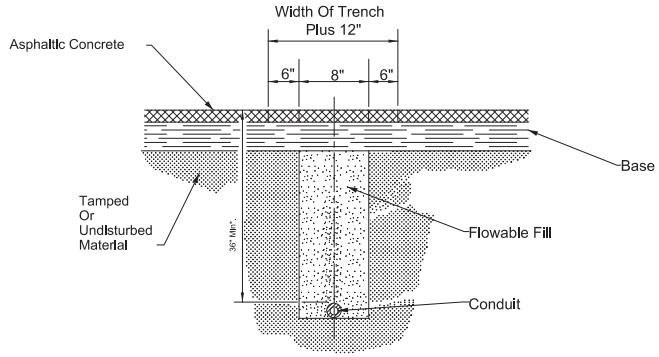


FOR USE IN ASPHALT ROADWAY ADJACENT TO GUTTER WHEN PLACEMENT OUTSIDE OF THE PAVEMENT IS NOT FEASIBLE.

FIGURE B

Notes:

1. Trench not to be open more than 250' at a time when contruction area is subject to vehicular or pedestrian traffic.
2. Asphalt to be sawcut to leave neat lines at the pavement cut.

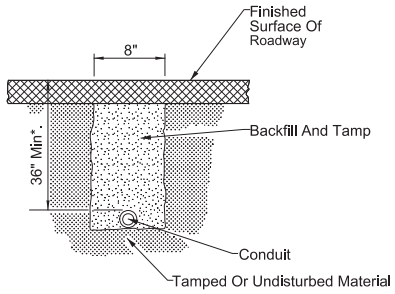


FOR USE IN INSTALLING CONDUIT UNDER EXISTING ASPHALT PAVEMENT NOT ADJACENT TO GUTTER WHEN JACKING OR DIRECT BORING IS NOT FEASIBLE

FIGURE C

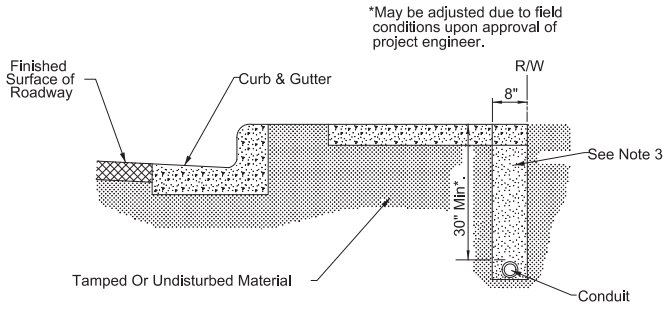
Notes:

1. Rigid conduit must be used when jacking under existing pavement at 36" minimum depth.
2. Asphalt to be sawcut at the edges of the trench.



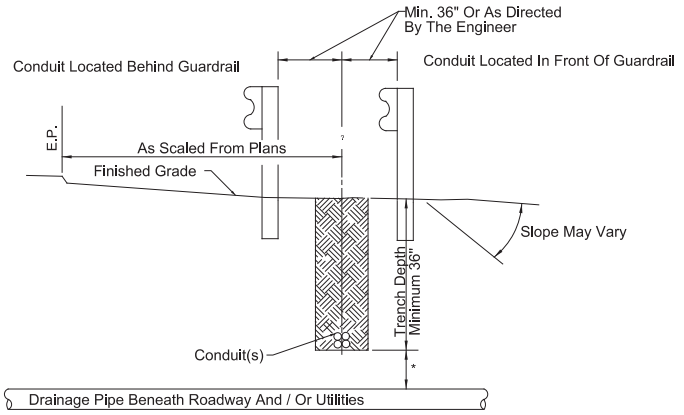
FOR USE INSTALLING CONDUIT UNDER A NEW ROADWAY PRIOR TO INSTALLATION OF BASE AND PAVEMENT

FIGURE D



FOR USE IN INSTALLING CONDUIT UNDER SIDEWALK

FIGURE E

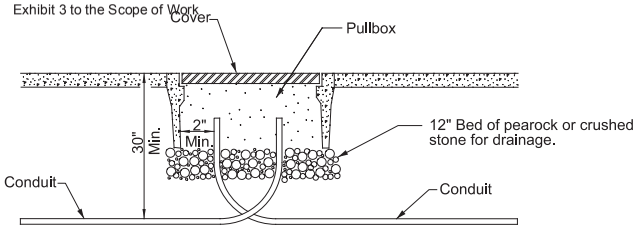


*Maintain 12" Minimum Vertical Clearance When Crossing Over Pipe And / Or Utilities. If Minimum Vertical Clearance Cannot Be Maintained, Then Conduit Is To Be Routed Under Pipe Maintaining 12" Minimum Vertical Clearance.

FIGURE F

MDC180

LATEST REVISION	DESCRIPTION:	TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS	DTPW TRAFFIC SIGNALS AND SIGNS DIVISION 7100 NW 36th STREET MIAMI, FLORIDA 33166 305.592.3580		NAME	DATE	CONDUIT INSTALLATION DETAILS (N.T.S.)	SHEET NO.
03/31/17				DRAWN BY	TRAVIS BREWER	12-09-16		1 of 2
				CHECKED BY	NAHUM FERNANDEZ	03-22-17		
				APPROVED BY: FRANK AIRA, P.E.				

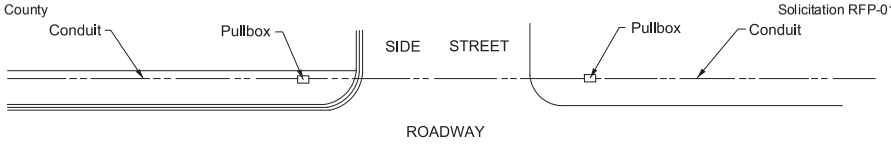


PULLBOX ENTRY OF CONDUIT UNDER SIDEWALKS

FIGURE G

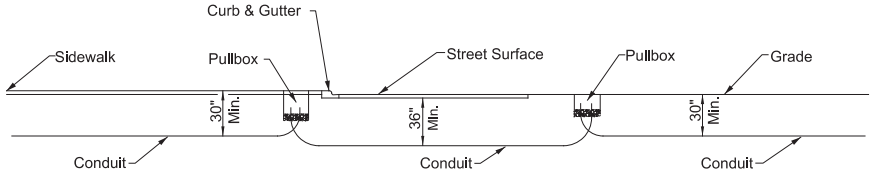
Note:

Ends of conduit shall be sealed in accordance with Section 630 of the FDOT Standard Specifications for Road and Bridge Construction, and the Miami-Dade County Traffic Control Equipment Standards and Specifications.



ROADWAY

PLAN



UNDER SIDEWALK

UNDER ROADWAY

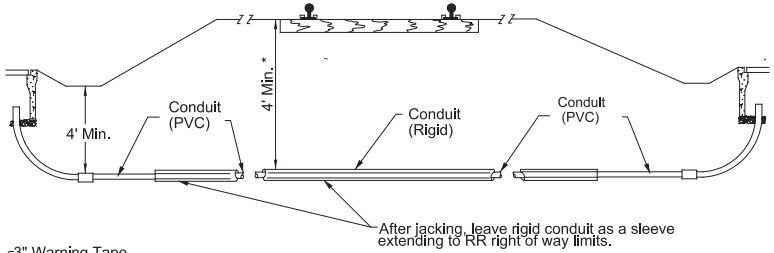
SECTION

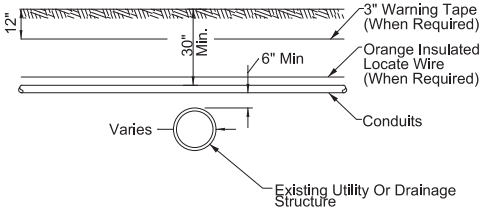
UNDER NONTRAFFIC BEARING SURFACE

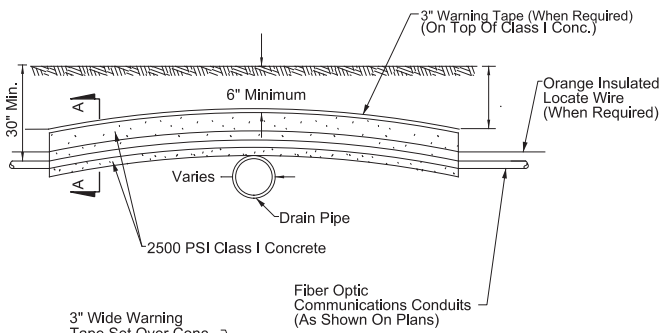
FIGURE H

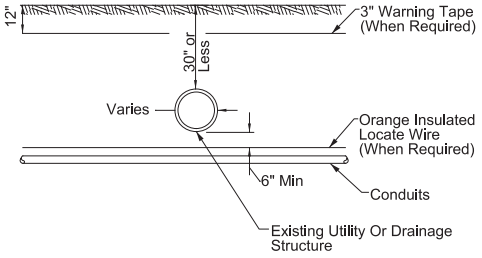
FIGURE I

FOR USE UNDER RAILROADS

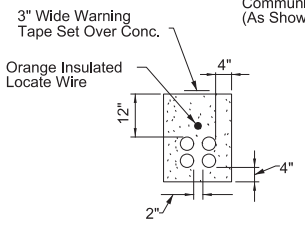








CONDUIT INSTALLATION DETAILS ACROSS EXISTING DRAIN PIPES OR UTILITIES



SECTION AA

GENERAL NOTES:

1. MEET THE REQUIREMENTS OF MIAMI-DADE COUNTY TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS SECTION 630 (CONDUIT).
2. THE CONTRACTOR, WITH APPROVAL FROM THE ENGINEER, MAY ADJUST THE FINAL BURIAL DEPTH OF THE CONDUIT(S) IN ORDER TO TRANSVERSE NONMOVABLE OBJECT CONFLICTS.
3. BACKFILL WITH EXCAVATED MATERIAL AND COMPACT THE SOIL UNTIL FIRM AND UNYIELDING. REMOVE ROCK AND DEBRIS FROM BACKFILL MATERIAL.
4. WHERE CONDUITS ARE TO BE INSTALLED OVER EXISITING UNDERGROUND STRUCTURES (E.G., DRAIN PIPES OR UTILITY LINES) WHICH ARE LESS THAN 30" DEEP, THE CONTRACTOR SHALL ENCASE THE CONDUIT IN 2500 PSI CLASS I CONCRETE FOR THE ENTIRE LENGTH OF CONDUIT THAT IS INSTALLED AT A DEPTH OF LESS THAN 30".
5. IF THE AMOUNT OF COVER OVER THE ENCASEMENT IS LESS THAN 6", THE CONTRACTOR SHALL INSTALL THE CONDUIT TO PASS BELOW THE UNDERGROUND STRUCTURES (E.G., DRAIN PIPES).

MDC181

LATEST REVISION	DESCRIPTION:	TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS	MIAMI-DADE	DTPW TRAFFIC SIGNALS AND SIGNS DIVISION 7100 NW 36th STREET MIAMI, FLORIDA 33166 305.592.3580		NAME	DATE	CONDUIT INSTALLATION DETAILS (N.T.S.)	SHEET NO.
03/31/17					DRAWN BY	TRAVIS BREWER	12-09-16		2 of 2
					CHECKED BY	NAHUM FERNANDEZ	03-22-17		
					APPROVED BY: FRANK AIRA, P.E.				

Exhibit 4

Traffic Control Equipment Standards and Specifications
Section 635 (Pull, Splice, and Junction Boxes)

SECTION 635
PULL, SPLICE, AND JUNCTION BOXES

PART 1 GENERAL

1.01 SUMMARY

A. Description

1. Furnish and install pull, splice, and junction boxes as shown in the Plans.

B. Method of Measurement

1. The Contract unit price each for pull, splice, and junction box, furnished and installed, will consist of the pull, splice, and junction box including all required hardware for the type of box and location as specified in the Contract Documents, and all labor and materials necessary for a complete and accepted installation.

C. Basis of Payment

1. Price and payment will be full compensation for all work specified in this Section, except grounding.
2. No separate payment for embedded junction boxes will be made. The Contractor shall include the cost of embedded junction boxes in the Contract unit price for the concrete substructure or superstructure items.
3. No separate payment will be made for the removal of pull, splice, and junction boxes.
4. Payment will be made under:

Item No.	Description	Unit
635-2-11	Pull & Splice Box, F&I, 13" X 24" Cover Size	EA
635-2-12	Pull & Splice Box, F&I, 24" X 36" Cover Size	EA
635-3-11	Junction Boxes, F&I, Aerial	EA
635-3-12	Junction Boxes, F&I, Mounted	EA

1.02 REFERENCES

A. Miami-Dade County Traffic Signals and Signs Division's Qualified Product List (TSSQPL)

B. FDOT Approved Product List (APL)

C. American Society for Testing and Materials (ASTM)

D. American Nation Standards Institute (ANSI)

PART 2 PRODUCTS

2.01 MATERIALS

A. General.

1. Use only pull and splice boxes that meet the requirements of this Specification and are listed on the FDOT's Approved Products List (APL) and the Department's Traffic Signals and Signs Division's Qualified Products List (TSSQPL).

B. Pull and Splice Boxes

1. General
   a. Manufacturers of concrete pull and splice boxes and covers must meet the requirements of FDOT Sections 105 and be currently on the FDOT's Production Facility Listing and.
   b. Ensure box bodies and covers are free of flaws such as cracks, sharp, broken, or uneven edges, and voids.
   c. Ensure in-ground boxes have an open bottom design.
2. Marking

   Ensure the following information is permanently cast into the top surface of all pull and splice box covers:

   a. Unless otherwise shown in the Plans, mark application as follows:
      1) "TRAFFIC SIGNAL" for signalized intersections
      2) "FIBER OPTIC CABLE" for fiber optic cable
      3) "LIGHTING" for highway lighting
      4) "ELECTRICAL" for other electrical applications
   b. Manufacturer's name or logo
   c. FDOT APL or Miami-Dade County TSSQPL approval number
   d. TIER rating
3. Ensure the date of manufacture (month/day/year, or date code) is permanently located on the top or bottom of the cover. Ensure the interior of the box body has a permanent marking that includes the manufacturer part/model number and date of manufacture near the top of box in a location that is visible after installation when the cover is removed.
4. Dimensions
   a. Unless otherwise shown in the Plans, provide pull and splice boxes with the following dimensions.
      1) For signalized intersection and lighting applications, provide pull boxes with nominal cover dimensions of 13 inches wide by 24 inches long or larger and no less than 12 inches deep. Ensure the inside opening area is a minimum of 240 square inches and no inside dimension is less than 12 inches.
      2) For fiber optic cable applications, provide pull boxes with nominal cover dimensions of 24 inches wide by 36 inches long or larger and no less than 24 inches deep.
      3) Provide rectangular splice boxes with nominal cover dimensions of 30 inches wide by 60 inches long or larger and no less than 36 inches deep. Provide round splice boxes with a nominal cover diameter of 36 inches or larger and no less than 36 inches deep.

5. Fabrication

   a. Provide box covers constructed of concrete, polymer concrete or other materials meeting the requirements of this Section.

   b. Provide box covers with lifting slots and a flush-seating lockdown mechanism. Use penta-head lockdown lag bolts. Ensure lockdown bolts and lifting slots are Type 316, 304, or 302 passivated stainless steel or brass. Ensure lockdown bolt assembly is designed to prevent seizing and can be removed without damaging the cover or box body. Ensure the lockdown bolt threaded insert/nut assembly is field replaceable.

6. Testing Requirements:

   For all pull and splice boxes submitted provide test data demonstrating conformance with the American National Standards Institute/Society of Cable Telecommunications Engineers (ANSI/SCTE) 77 2013 Specification for Underground Enclosure Integrity for TIER 15.

C. Junction Boxes

Fabrication.

Provide galvanized steel, aluminum or NEMA 4X non-metallic junction boxes. Ensure all attachment hardware is Type 316 or 304, passivated stainless steel.

1. Ensure the outside surface has a smooth, uniform finish. Ensure boxes are free of burrs, pits, sharp corners and dents. Ensure all welds are neatly formed and free of cracks, blow holes, and other irregularities.

   a. Aerial Junction Boxes

      Unless otherwise shown in the Plans, provide aerial junction boxes with minimum inside dimensions of 8 inches wide by 8 inches long and at least 3 inches deep.

   b. Mounted Junction Boxes

      Provide mounted junction boxes fabricated of 5052 sheet aluminum alloy with a minimum thickness of 1/8 inch. Ensure all mounted junction boxes have a hinged door and lock as specified in FDOT Specification Section 676.

      Unless otherwise shown in the Plans, provide mounted junction boxes for the following installations:

      1) For pole and cabinet mounted installations, provide junction boxes with minimum inside dimensions of 13 inches long by 10 inches wide and at least 3 inches deep.

      2) For base mounted installations, provide junction boxes with minimum inside dimensions of 21 inches long by 10 inches wide and at least 8 inches deep.

   c. Embedded Junction Boxes

      1) Provide weatherproof embedded junction boxes for use in concrete substructures or superstructures. Include gasketed weatherproof covers made of the same material as the box and Type 316 or 304, stainless steel, tamper resistant screws for securing the cover. Fabricate galvanized steel boxes and their covers from steel meeting the requirements of ASTM A36 and galvanized in accordance with ASTM A123.

      2) For embedded junction boxes not exposed to vehicular impacts, provide the following types of junction boxes.

         1. Where the structure’s environmental classification is slightly or moderately aggressive, provide a galvanized steel or NEMA 4X (non-metallic) box, as approved by the Engineer.

2. Where the structure's environmental classification is extremely aggressive, provide a NEMA 4X (non-metallic) box, unless otherwise directed by the Engineer.

3) For embedded junction boxes exposed to vehicular impacts, provide a galvanized steel box regardless of the structure's environmental classification.

2. Barrier Terminal Blocks

a. Provide a barrier terminal block with a minimum of ten positions and rated at 600 V_{AC} in all aerial and mounted junction boxes. Ensure each terminal block position has two screws electrically connected by a shorting bar or other Department approved method. Ensure all terminal block positions are numbered sequentially.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. Do not install power and communication cables in the same box unless otherwise shown in the Plans.
2. When signal or 120 volt (or greater) power is present, ground all metal covers in accordance with FDOT Specification Section 620.

B. Pull and Splice Boxes

Install pull and splice boxes in accordance with the Miami-Dade Pull Box / Fiber Optic Box Details (N.T.S), Index. Ensure pull and splice boxes are sized for the amount of cable to be placed inside. Ensure that the pull or splice box cover is flush with the concrete apron or sidewalk. Do not install pull or splice boxes in roadways, driveways, parking areas, ditches or public sidewalk curb ramps. Avoid placing pull and splice boxes in low-lying locations with poor drainage. Ensure that pull and splice boxes house fiber optic cable without subjecting the cable to a bend radius less than 14 times the diameter of the cable.

1. Placement and Spacing

Place pull and splice boxes as shown in the Plans and at the following locations, unless directed otherwise by Engineer:

a. At all major fiber optic cable and conduit junctions.
b. Approximately every 2,500 feet for fiber optic cable applications in rural areas with any continuous section of straight conduit if no fiber optic cable splice is required.
c. At a maximum of 1,760 feet for fiber optic cable applications in metropolitan areas.
d. At each end of a tunnel, and on each side of a river or lake crossing.
e. On each side of an aboveground conduit installation, such as an attachment to a bridge or wall.
f. At all turns in the conduit system.
g. Near the base of a service pole or communication cabinet to provide:

1) A transition point between the fiber optic conduits extending from the fiber backbone and the conduit feeding the communication cabinet.

2) An assist point for the installation of fiber optic drop cable.

3) Storage of slack fiber optic drop cable.

2. Electronic Box Marker

   Equip all pull and splice boxes buried below finish grade with an electronic box marker inside the pull or splice box to mark the location. Ensure that the electronic box marker is a device specifically manufactured to electronically mark and locate underground facilities. Ensure that the electronic box marker includes circuitry and an antenna encased in a waterproof polyethylene shell. Ensure that the outer shell is impervious to minerals, chemicals, and temperature extremes normally found in underground plant environments. Ensure that the electronic box marker does not require any batteries or active components to operate. Ensure that electronic box markers used to mark fiber optic cable and general telecom applications are orange in color and operate at 101.4 kHz. Ensure that the electronic box marker's passive circuits produce an RF field when excited by a marker locator to direct the locator to the marker's position. Ensure that the electronic box marker has a minimum operating range of 5 feet from the marker locator.

C. Aerial Junction Boxes

   Install aerial junction boxes in accordance with FDOT Design Standards, Index No. 17733.

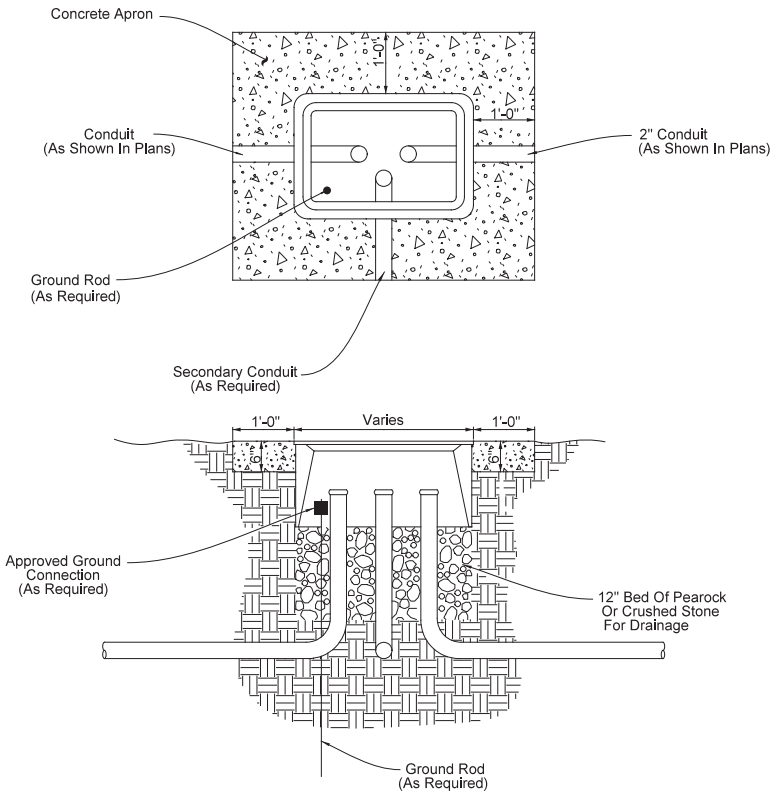
D. Mounted Junction Boxes

   Ensure that the bottom surface of pole mounted junction boxes is a minimum of 4 feet above the finished grade.

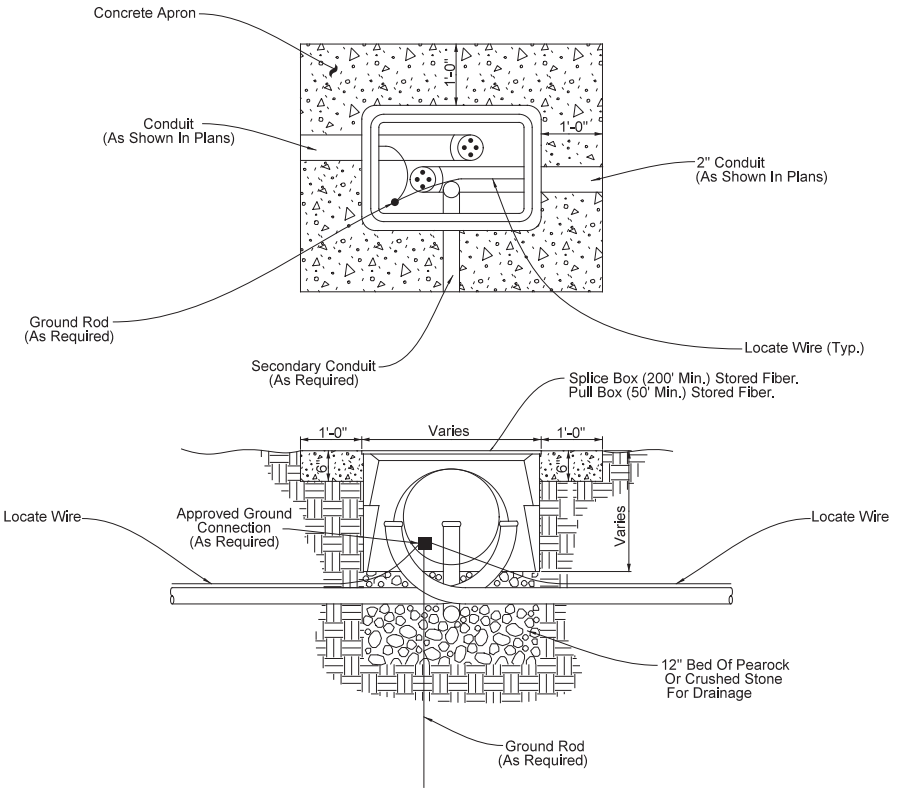
E. Cable Terminations

   Make cable terminations in junction boxes in accordance with FDOT Specification Section 632. Route and form the cable to allow access to the terminal screws. Do not cover the terminal identification numbers with the cable.

END OF SECTION 635



PULL BOX



FIBER OPTIC BOX

Rectangular boxes are depicted. Round fiber optic splice boxes and lids are allowed.

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GENERAL NOTES:

1. MEET THE REQUIREMENTS OF MIAMI-DADE COUNTY TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS SECTION 635 (PULL, SPLICE, AND JUNCTION BOXES)
2. BOXES SHALL NOT BE INSTALLED IN ROADWAYS OR DRIVEWAYS.
3. BOXES SHALL BE ON THE FDOT APPROVED PRODUCT LIST (APL) AND THE MIAMI-DADE COUNTY QUALIFIED PRODUCT LIST (QPL)
4. BOXES SHALL BE INSTALLED FLUSH WITH THE FINISHED GRADE SURFACE.
5. FIBER OPTIC SPLICE BOXES SHALL BE PROVIDED WITH CABLE HANGER RACKS DESIGNED TO SUPPORT CABLES AND SPLICE ENCLOSURES. COST OF RACKS TO BE INCLUDED IN COST OF SPLICE BOX.
6. FIBER OPTIC BOXES SHALL CONTAIN ONLY FIBER OPTIC CABLE, CONDUIT, AND LOCATE WIRE
7. CONDUIT CENTER LINE SHALL BE ALIGNED TO TOP EDGE OF BOX TO FACILITATE CABLE PULLING.
8. CONDUIT CENTER LINE SHALL BE ALIGNED TO TOP EDGE OF BOX TO FACILITATE CABLE PULLING.
9. ALL BOXES SHALL HAVE 1'-0" WIDE (MIN.) CONCRETE APRON. CONCRETE FOR CONCRETE APRONS SHALL BE CLASS NS WITH A MINIMUM STRENGTH AT 28 DAYS OF F'C=2.5 KSI. APRONS SHALL BE SLOPED AWAY FROM BOX. COST OF APRON TO BE INCLUDED IN THE COST OF EACH BOX.
10. PREVENT THE INGRESS OF WATER, DIRT, SAND, AND OTHER FOREIGN MATERIALS INTO THE CONDUIT PRIOR TO, DURING AND AFTER CONSTRUCTION USING A FOAM-SEALING MATERIAL, RUBBER PLUG, OR OTHER DEVICE DESIGNED FOR THIS APPLICATION.
11. WHERE MULTIPLE PULL BOXES ARE PLACED SIDE BY SIDE, MAINTAIN AT LEAST 8" BETWEEN THE PULL BOXES.

LATEST REVISION	DESCRIPTION:	TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS	MIAMI-DADE	DTPW TRAFFIC SIGNALS AND SIGNS DIVISION 7100 NW 36th STREET MIAMI, FLORIDA 33166 305.592.3580		NAME	DATE	PULL BOX / FIBER OPTIC BOX DETAILS (N.T.S.)	SHEET NO.
03/31/17					DRAWN BY	TRAVIS BREWER	12-09-16		1 of 1
					CHECKED BY	NAHUM FERNANDEZ	03-22-17		
					APPROVED BY: FRANK AIRA, P.E.				

Exhibit 5

Traffic Control Equipment Standards and Specifications
Section 660 (Vehicle Detection System)

SECTION 660
VEHICLE DETECTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Description

1. Furnish and install vehicle detection system in accordance with the Contract Documents. Use only vehicle detection systems that meet the requirements of this Specification and are listed on the FDOT's Approved Products List (APL) and the Department's Traffic Signals and Signs Division's Qualified Products List (TSSQPL).

B. Method of Measurement

1. Furnish and Install:

a. Inductive Loops

1) The Contract unit price for each Inductive Loop Detector furnished and installed at the traffic signal cabinet includes all labor, equipment, testing and configuration necessary for a complete and accepted installation.

2) The Contract unit price for each Loop Assembly, furnished and installed, will include all equipment, labor, equipment, and materials necessary for a complete and accepted installation of the entire loop assembly as specified in the Contract Documents including the shielded lead-in cable into the traffic signal cabinet, proper termination, and testing.

b. Microwave Vehicle Detection System

1) The Contract unit price for Microwave Vehicle Detection System (MVDS), Cabinet Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the MVDS installation at each traffic signal cabinet location.

2) The Contract unit price for Microwave Vehicle Detection System (MVDS), Above Ground Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, routing of cables and wiring properly terminating inside the traffic signal cabinet, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the above ground MVDS work for each intersection approach.

c. Video Vehicle Detection System

1) The Contract unit price for Video Vehicle Detection System (VVDS), Cabinet Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the VVDS installation at each traffic signal cabinet location.

2) The Contract unit price for Video Vehicle Detection System (VVDS), Above Ground Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, routing of cables and wiring properly terminating inside the traffic signal cabinet, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the above ground VVDS work for each camera.

d. Wireless Magnetometer Detection System

1) The Contract unit price for a Wireless Magnetometer Detection System (WMDS), Cabinet Equipment, furnished and installed, will include furnishing, placement, and testing of all materials and equipment, and for all tools, labor, equipment, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the work at each interection.

2) The Contract unit price for a Wireless Magnetometer Detection System (WMDS), Above Ground Equipment, furnished and installed, includes all materials, tools, labor, equipment, approved mounts and hardware, routing of cables and wiring properly terminating inside the traffic signal cabinet, operational software packages and firmware, supplies, support, testing, calibration, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the above ground WMDS work for each intersection.

3) Separate payment will be made for each magnetometer in-road device furnished and installed in conjunction with the WMDS installation, pursuant to the Contract Documents, and approved locations depicted on the Plans.

e. Automatic Vehicle Identification

1) The Contract unit price for a complete Automatic Vehicle Identification (AVI) detection system, furnished and installed, will include furnishing, placement, and testing of all materials and equipment, and for all tools, labor, equipment, hardware, operational software packages and firmware, supplies, support, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the work at each location.

C. Basis of Payment

1. Price and Payment under the applicable pay item below will be full compensation for all work specified in this Section.

2. Payment will be made under (Pay Items Numbers for Department Contracts to be determined by the Contracts and Specifications Section):

Item No.	Description	Unit
660-1-109C	Inductive Loop Detector, F&I	EA
660-2-106	Loop Assembly, F&I, Type F	AS
660-2-106M	Loop Assembly, F&I, Type F Modified (Bicycle)	AS
660-3-11	Vehicle Detection System- Microwave, F&I Cabinet Equipment	EA
660-3-12	Vehicle Detection System- Microwave, F&I Above Ground Equipment	EA
660-4-11	Vehicle Detection System- Video, F&I Cabinet	EA

	Equipment	
660-4-12	Vehicle Detection System- Video, F&I Above Ground Equipment	EA
660-5-11	Vehicle Detection System- Wireless Magnetometer, F&I, Cabinet Equipment	EA
660-5-12	Vehicle Detection System- Wireless Magnetometer, F&I, Above Ground Equipment	EA
660-5-13	Vehicle Detection System- Wireless Magnetometer, F&I, In-Road Electronics	EA
660-6-120	Vehicle Detection System- Avi, Bluetooth, F&I, Complete System	EA

1.02 SYSTEM DESCRIPTION

A. Classification of Types

1. Functional Types

a. Vehicle Presence Detection System: Vehicle presence detectors produce a corresponding output any time that a vehicle occupies the physical or virtual area of the detector.

b. Traffic Data Detection System: Traffic data detectors provide presence, volume, occupancy, and speed data for the lanes they are configured to monitor.

c. Probe Data Detection System: Probe data detection systems provide speed data and travel times for a road segment. Probe data detectors use automatic vehicle identification (AVI) technologies to establish a unique identifier for each vehicle they detect. This identifier is then transmitted to a central site where it can be matched to past or future detections of the same vehicle at different detector locations.

2. Technology Types

a. Inductive Loop Detection System: An inductive loop detection system uses a minimum of one inductive loop and loop detector. The system operates by energizing and monitoring wire embedded in the road surface to detect vehicle presence and provide an output to traffic controllers or other devices that can generate volume, occupancy, and speed data (detection output).

b. Video Vehicle Detection System (VVDS): A VVDS uses one or more cameras and video analytics hardware and software to detect vehicle presence, provides a detection output, and generates volume, occupancy, and speed data.

c. Microwave Vehicle Detection System (MVDS): A MVDS transmits, receives, and analyzes a FCC-certified, low-power microwave radar signal to detect vehicle presence, provide a detection output, and generate volume, occupancy, and speed data.

d. Wireless Magnetometer Detection System (WMDS): A WMDS uses one or more battery-powered wireless sensors embedded in the road surface, which communicates data by radio to a roadside receiver. Wireless magnetometer systems detect vehicle presence and provide a detection output to traffic controllers or other devices that can generate volume, occupancy, and speed data.

e. Automatic Vehicle Identification (AVI): AVI detection systems use one or more different methods to collect information that can be used to establish a unique

identifier for each vehicle detected and the time and location that the vehicle was detected. AVI detection systems collect data using probe detectors that utilize radio-frequency identification (RFID), optical character recognition, magnetic signature analysis, laser profiling, Bluetooth®, or other technologies to establish vehicle identifier, time, and location.

B. Design Requirements

1. Provide stop bar detection in all lanes to provide a detection system that is capable of supporting a fully-actuated intersection and meet the requirements of the standard details for vehicle detection of the Miami-Dade County Traffic Control Equipment Standards and Specifications.
2. Use Inductive Loop Detection System technology type unless an alternate technology described herein is demonstrated by the Engineer of Record to be more suitable and reliable for the intersection under design. Written Department approval is required for use of detection technologies other than inductive loops.
3. Vehicle Detection Zones.
    a. In addition to the Stop Bar Detection required by the standard details, the Department may approve the following general detection zones for use in a signal plan design where appropriate due to site-specific operational requirements:
        1) Queue Detection: Used on protected/permissive left turn lanes in addition to stop bar detection. Leading edge is placed at 50 feet from the Stop Bar.
        2) Long-Loop-Occupancy Detection: Used in each through lanes on very low-speed (25 mi/h or less) approaches for signal green time extension. Provided by increasing the length of the Stop Bar inductive loop detection to 50 feet from the Stop Bar.
        3) Multiple-Point Detection: Used on through lanes to ameliorate dilemma zone problems through the strategic placement of multiple sensors at high-speed (greater than 40 mi/h) approaches to intersections controlled by actuated controllers. Design based on guidance provided in Chapter 4, of the FHWA Traffic Detector Handbook: Third Edition—Volume I Inductive-loop detector placement in multiple-point detection systems used to ameliorate effects of dilemma zones.

1.03 WARRANTY

A. Ensure that vehicle detection and data collection systems have a manufacturer's warranty covering defects for a minimum of 5 years from the date of final acceptance by Engineer in accordance with the Contract Documents and Section 600. Ensure the warranty includes providing replacements, within 10 calendar days of notification, for defective parts and equipment during the warranty period at no cost to the County.

PART 2 PRODUCTS

2.01 INDUCTIVE LOOP DETECTION SYSTEM

A. Materials.

1. Use inductive loop detectors and loop sealant currently listed on the FDOT's APL and the Department's TSSQPL.

2. Inductive Loop Detector Units: Ensure loop detector units meet the requirements of NEMA TS-2-2016.
3. Loop Wire:
    a. Use No. 14 AWG stranded copper wire with Type XHHW cross-linked polyethylene insulation and an additional outer sleeve composed of polyvinylchloride or polyethylene insulation that meets the requirements of International Municipal Signal Association (IMSA) 51-7.
    b. The wire must have surface-printed information indicating the manufacturer ID and its NRTL listing (UL, CSA, etc.), the maximum rated voltage, AWG size, the proper type letter or letters for the type of wire or the IMSA specification number every 2 feet or less.
4. Shielded Lead-in Cable: Use No. 14 AWG two conductor, stranded copper wire with shield and polyethylene insulation, meeting the requirements for IMSA 50-2.
5. Splicing Material:
    a. Use rosin-core solder for soldered splices.
    b. Butt-end connectors must be non-insulated Panduit Part Number BS14, BS10; Ideal Model Number TV16X, TV12X; Thomas and Betts Catalog Number BB-2, CC-2 or Engineer approved equivalent.
    c. Insulated tubing used to cover splice must be heat-shrinkable, cross-linked polyolefin with a silicon sealant inside the tubing and an insulation rating of at least 600 V. Outer tubing must be dual/multiple wall type.
    d. Splicing tape must be self-fusing silicone rubber.
6. Loop Sealant:
    a. Ensure that loop sealant:
        1) Is manufactured for traffic loop embedding in both asphalt and concrete pavement.
        2) Consists of multi-component systems having simple mix ratios of 1:1 or 2:1 or are supplied in pre-measured containers in which all contents of both packages are to be mixed.
        3) Is self-leveling when applied.
        4) Does not run out of unlevel slots as tested for viscosity using ASTM D562 at 77°F.
        5) Is tack free within a maximum of 2 hours from time of application and when cured as tested for tack free time using ASTM C679 at 77°F.
        6) Securely adheres to concrete and asphalt when installed in a 3/8 inch by 3 inch saw cut, cured for 2 weeks at 77°F as tested for adhesion using visual inspection.
        7) Shows no visible signs of shrinkage after curing when installed in a 3/8 inch by 3 inch saw cut, cured for 2 weeks at 77°F as tested for shrinkage using a dimensional measurement.
        8) Resists weather, oils, gasoline, antifreeze, and brake fluid as tested for absorption using ASTM D570 for water, No. 3 oil, gasoline, antifreeze, and brake fluid for 24 hours.
        9) Resists penetration of foreign materials as tested for durometer hardness using ASTM D2240 Shore A for 24 hours.

10) Resists cracking caused by expansion and contraction due to temperature changes as tested for tensile strength and elongation using ASTM D412.

11) Does not become brittle with age or temperature extremes as tested for weight loss, cracking, and chalking using ASTM C1246.

12) Has a minimum shelf life of 1 year in undamaged containers when stored per manufacturer recommendations.

2.02 VIDEO VEHICLE DETECTION SYSTEM (VVDS)

A. Configuration and Management:

1. Ensure that the VVDS:
   a. Is provided with software that allows local and remote configuration and monitoring.
   b. Can display detection zones and detection activations overlaid on live video inputs.
   c. Allows a user to edit previously defined configuration parameters, including size, placement, and sensitivity of detection zones.
   d. Retains its programming in nonvolatile memory.
2. Ensure that the detection system configuration data can be saved to a computer and restored from a saved file. Ensure that all communication addresses are user programmable.
3. Ensure that the detection system software offers an open Application Programming Interface (API) and software development kit available to the Department at no cost for integration with third party software and systems.

B. Detection Camera: Provide a camera that is furnished or approved by the video detection system manufacturer.

C. Machine Vision Processor: Ensure the VVDS includes a machine vision processor that allows video analysis, presence detection, data collection, and interfaces for inputs and outputs as well as storage and reporting of collected vehicle detection data.

D. Video Inputs and Outputs: Ensure that analog video inputs and outputs utilize BNC connectors.

E. Solid State Detection Outputs: Ensure outputs meet the requirements of NEMA TS2-2016, 6.5.2.26.

F. Electrical Requirements: Ensure the system operates using a nominal input voltage of 120 volts of alternating current (V_{AC}). Ensure that the system will operate with an input voltage ranging from 89 to 135 V_{AC}. If a system device requires operating voltages other than 120 V_{AC}, supply a voltage converter.

2.03 MICROWAVE VEHICLE DETECTION SYSTEM (MVDS)

A. Ensure that MVDS used for stop bar intersection presence detection can detect vehicles throughout a minimum detection range of 6-140 feet from the sensor and are capable of detecting up to 10 lanes of traffic.

B. Ensure that MVDS used for dilemma zone protection can detect vehicles throughout a minimum detection range of 50-600 feet from the sensor; can report the speed, range, and estimated time of arrival at the stop bar of each vehicle detected; and can provide contact closure outputs when a vehicle meeting user-defined alert criteria is detected.

C. Ensure that sidefire MVDS sensors used for data collection have a minimum 200-foot range and the capability to detect 8 lanes of traffic.

D. Configuration and Management:

1. Ensure that the MVDS is provided with software that allows local and remote configuration and monitoring. Ensure that the system software can display detection zones and detection activations in a graphical format.
2. Ensure that the MVDS allows a user to edit previously defined configuration parameters, including size, placement, and sensitivity of detection zones.
3. Ensure that the MVDS retains its programming in nonvolatile memory. Ensure that the detection system configuration data can be saved to a computer and restored from a saved file. Ensure that all communication addresses are user programmable.
4. Ensure that the detection system software offers an open API and software development kit available to the Department at no cost for integration with third party software and systems.

E. Solid State Detection Outputs: Ensure outputs meet the requirements of NEMA TS2-2016, 6.5.2.26.

F. Electrical Requirements: Ensure the microwave detector will operate with a nominal input voltage of 12 V_{DC}. Ensure the microwave detector will operate with an input voltage ranging from 89 to 135 V_{AC}. If any system device requires operating voltages other than 120 V_{AC}, supply a voltage converter.

G. Ensure that the detector is FCC-certified and that the FCC identification number is displayed on an external label. Ensure that the detector transmits within a frequency band of 10.525 gigahertz, plus or minus 25 megahertz, or another FCC-approved spectral band.

2.04 WIRELESS MAGNETOMETER DETECTION SYSTEM (WMDS)

A. Configuration and Management:

1. Ensure that the detection system is provided with software that allows local and remote configuration and monitoring.
2. Ensure that the WMDS allows a user to edit previously defined configuration parameters.
3. Ensure that the WMDS retains its programming in nonvolatile memory. Ensure that the detection system configuration data can be saved to a computer and restored from a saved file. Ensure that all communication addresses are user programmable.
4. Ensure that the detection system software offers an open API and software development kit available to the Department at no cost for integration with third party software and systems.

B. Solid State Detection Outputs: Ensure outputs meet the requirements of NEMA TS2-2016, 6.5.2.26.

C. Electrical Requirements: Ensure the detection system will operate with an input voltage ranging from 89 to 135 V_{AC}. If any system device requires operating voltages other than 120 V_{AC}, supply a voltage converter.

2.05 AUTOMATIC VEHICLE IDENTIFICATION (AVI) DETECTION SYSTEM

A. Configuration and Management: Ensure that the detection system is provided with software that allows local and remote configuration and monitoring.

B. Probe Detector Requirements:

1. Transponder Readers: Ensure transponder readers are compatible with multiple tag protocols, including Allegro and the protocol defined in ISO18000-6B.
2. Bluetooth Readers: Ensure that Bluetooth readers will operate using solar power and cellular communications. Ensure that Bluetooth readers will operate using power over Ethernet. Ensure that Bluetooth readers will operate with a nominal input voltage of 12 V_{DC}.
3. License Plate Readers: License plate readers must not require the use of visible strobes or other visible supplemental lighting.

C. Electrical Requirements: Ensure the detection system will operate with an input voltage ranging from 89 to 135 V_{AC}. If any system device requires operating voltages other than 120 V_{AC}, supply a voltage converter.

2.06 COMMUNICATIONS

A. Communication requirements for VVDS, MVDS, WMDS and AVI:

1. Ensure that the VVDS includes a minimum of one Ethernet communications interface. Ensure that components of the MVDS, WMDS and AVI detection system (such as sensors, controllers, and processing hardware) include a minimum of one serial or Ethernet communications interface.
2. Ensure serial interfaces and connectors conform to applicable Telecommunications Industry Association (TIA) standards. Ensure that serial ports support data rates up to 115200 bps; error detection utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2). MVDS sensors must a serial interface that supports RS-232 and RS-485.
3. Ensure that wired Ethernet interfaces provide a 10/100 Base TX connection. Verify that all unshielded twisted pair/shielded twisted pair network cables and connectors comply with TIA-568.
4. Ensure wireless communications are secure and that wireless devices are Federal Communications Commission (FCC) certified. Ensure that the FCC identification number is displayed on an external label and that all detection system devices operate within their FCC frequency allocation.
5. Ensure cellular communications devices are compatible with the 4G system and cellular carrier used by the agency responsible for system operation and maintenance.
6. Ensure the system can be remotely configured and monitored via one or more communications interface

2.07 MECHANICAL REQUIREMENTS FOR ALL DETECTORS

A. Ensure that all parts are made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

B. Ensure that all fasteners exposed to the elements are Type 304 or 316 passivated stainless steel.

2.08 ENVIRONMENTAL REQUIREMENTS FOR ALL DETECTORS

A. Meet the environmental requirements of NEMA TS-2-2016.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation Requirements for all detectors:

1. Install, configure, and demonstrate a fully functional vehicle detection system, as shown in the plans. Connect all field equipment to the existing communication network, and provide all materials specified in the Contract Documents. Install all equipment according to the manufacturer's recommendations and these Specifications.
2. Mount above-ground detectors on existing poles or sign structures, or on new poles, as shown in the Plans. Furnish all equipment with the appropriate power and communication cables. Install the power cable and the communication cables according to the manufacturer's recommendation. Ensure that the cables comply with NEC sizing requirements and meet all other applicable standards, specifications, and local code requirements.
3. Do not install communication cables in the same conduit or pull boxes as power cables carrying voltage greater than 24 V_{DC}/V_{AC} or current in excess of 1.5 amps.
4. Cut cabinet wiring to the proper length. Do not double back wire to take up slack. Neatly lace wires into cables with nylon lacing or plastic straps. Secure cables with clamps and provide service loops at all connections.
5. In the event that power to the vehicle detection system or a subcomponent thereof is interrupted, ensure that the equipment automatically recovers after power is restored. Ensure that all programmable system settings return to their previous configurations and the system resumes proper operation.

B. Inductive Loop Detector Installation:

1. Except as otherwise specified herein, install vehicle loops in accordance with the manufacturer's instructions, standard details for vehicle detection of the Miami-Dade County Traffic Control Equipment Standards and Specifications, and the Plans.
2. Unless otherwise specified in the Plans, stop bar loops in vehicular travel lanes must be thirty feet long Type F loops. Where specified in the Plans, a modified 3' x 20' Type F loop may be installed in dedicated bicycle lanes.
3. The leading edge of a loop cannot extend more than ten feet past the stop line.
4. The saw cut may not encroach into the crosswalk.
5. Inductive Loop-Detector Units: Adjust the operating frequency of each detector unit, if required, to prevent crosstalk of the units.
6. Saw Cuts:

a. Saws must be equipped with a depth gauge to assist in maintaining proper depth and a horizontal guide to assure alignment.

b. Use a chalk line or equivalent method to outline the perimeter of the loop on the pavement and routes for lead-in cables. Do not allow the saw cut in the pavement to deviate by more than 1 inch from the chalked line.

c. Ensure that all saw cuts are free of any dust, dirt or other debris and completely dry prior to the installation of the loop wire, loop wire twisted pair lead or lead-in cable. Use compressed air to thoroughly dry the sawed slot.

d. Make saw cuts in accordance with standard details for vehicle detection of the Miami-Dade County Traffic Control Equipment Standards and Specifications unless otherwise stipulated in the Contract Documents.

e. Ensure that the top conductor of the loop wire or lead-in cable is a minimum of 2 inch below the final surface of the roadway.

7. Loop Wire:

a. Ensure that the first turn of the loop wire is placed in the bottom of the saw cut, with each subsequent turn placed on top of the preceding turn. Push the loop wire to the bottom of the saw cut with a non-metallic tool which will not damage the insulation.

b. Label the loop wires in the pull box with waterproof tags and identify the start (S), finish (F) lead and the loop number.

c. Use alternate polarity on adjacent loops.

d. Hold the loop in place with strips of rubber, neoprene, flexible tubing, or foam backer rod as approved by Engineer. Ensure that the backer rod material is non-metallic, is placed in the saw slot using segments 1 to 2 inches long, spaced 12 inches apart, and that the distance from the top of the hold down material to the final surface of the roadway is not less than 1.5 inches.

8. Loop Wire Twisted Pair Lead:

a. Create a loop wire twisted pair lead by twisting the loop wire pair a minimum of 10 turns per foot to form a loop wire twisted pair lead from the edge of the loop to the pull box located adjacent to the roadway. Place only one loop wire twisted pair lead in a saw cut. Ensure that the distance between a twisted loop wire pair lead within the roadway is a minimum of 6 inches from any other twisted loop wire pair lead or loop, until they are within 1 foot of the edge of pavement or curb, at which point they may be placed closer together.

b. Hold the loop wire twisted pair lead in place with strips of rubber, neoprene, flexible tubing, or foam backer rod as approved by Engineer. Ensure that the backer rod material is non-metallic, is placed in the saw slot using segments 1 to 2 inches long, spaced 24 inches apart, and that the distance from the top of the hold down material to the final surface of the roadway is not less than 1.5 inches.

c. Provide a minimum of 3 feet of twisted loop wire pair lead in the pull box located adjacent to the roadway. Do not route twisted loop wire pair lead directly through conduits to the cabinet, unless otherwise shown in the Plans.

9. Splicing:

a. Splices must be made by crimping and soldering. Splice lead-in cable to the loop wire in accordance with these Specifications.

b. Perform the splicing in a pull box located off the roadway, not in the roadway itself. Splices must be made on the same day wires are installed unless the ends of the wires are sealed with Scotchkote to keep water out of the insulating jacket.

c. Strip insulation of loop wires and lead-in cable as necessary. Clip one of the loop wires 3 inches shorter than other and clip the non-corresponding lead-in cable wire accordingly in order to stagger the splices.

d. Splice the black conductor of the lead-in cable to the finish (F) “lead” of the loop.

e. Crimp the appropriate wires with a non-insulated butt connector using a pressure crimping tool that provides a uniform 360-degree crimp. Insulate each wire splice separately using cross-linked polyolefin tubing.

f. Insulate the total splice using dual/multiple wall cross-linked polyolefin tubing.

g. Ensure that the ends of the cable jackets, twisted pair and lead-in, are encased in the loop splice material.

h. Ensure that each loop has an individual return to the cabinet and series splicing is performed on a separate terminal block in the cabinet.

10. Terminations:

a. Using insulated terminal lugs, terminate lead-in cables or twisted pair loop wire on a terminal strip which is located in the controller or detector cabinet.

b. Use a calibrated ratchet type crimping tool to attach the lugs to the conductors of the lead-in cable or twisted loop wire.

11. Loop Sealant:

a. Prepare the loop sealant in accordance with the manufacturer’s instructions.

b. Using a manufacturer approved applicator or dispenser, apply only sufficient sealant to completely fill the saw cut without overfilling

c. Remove excess material from pavement.

d. Ensure that the loop sealant has cured completely before allowing vehicular traffic to travel over the sealant.

12. Loop Assembly Identification: Identify and tag each loop assembly in the controller or detector cabinet by lane and movement number.

C. Video Detector Installation:

1. Install cameras and configure detection zones and settings in accordance with the Contract Documents, standard details for vehicle detection of the Miami-Dade County Traffic Control Equipment Standards and Specifications, manufacturer’s recommendations, and as directed by Engineer.

2. Submit configuration settings (including, but not limited to detector names, communication settings, and output assignments) and configuration file backups to Engineer.

3. Submit a graphical depiction of each camera site, its pole location, mounting height, the ratio of distance away from the camera versus the mounting height, the camera’s mounting type (i.e., pole or structure), camera aiming procedures, and the placement of the proposed detection zone for each lane.

4. Do not use coaxial cable runs in excess of 500 feet. Mount and aim cameras in a manner that eliminates as much environmentally generated glare as possible.

5. For systems where composite cables are used, Power over Ethernet (PoE) injectors are required for cable runs longer than 330 ft .

D. Microwave Detector Installation:

1. Install detector and configure detection zones and settings in accordance with the Contract Documents, manufacturer’s recommendations, and as directed by Engineer.

2. Submit configuration settings (including, but not limited to detector names, communication settings, and output assignments) and configuration file backups to Engineer.

E. Wireless Magnetometer Installation:

1. Install in accordance with the Contract Documents, manufacturer's recommendations, and as directed by Engineer.
2. Ensure that materials used for the installation of magnetometers in the road surface have cured completely before allowing vehicular traffic to travel over them.

F. AVI Detection System Installation:

1. Install in accordance with the Contract Documents, manufacturer's recommendations, and as directed by Engineer.

3.02 INDUCTIVE LOOP PERFORMANCE REQUIREMENTS

A. Obtain latest Department's Loop Assembly Test Form from Engineer. Tests must be performed and the form completed and signed by a Contractor representative that is IMSA Traffic Signal Level II certified. Deliver the completed original to Engineer prior to Engineer's inspection and place a copy in the controller cabinet.

B. Measure loop inductance, series resistance, insulation resistance, and quality factor. Take measurements both at the junction box (loop including twisted pair lead-in) and the Cabinet (loop and shielded lead-in cable). Measurements at the junction box must be taken before and after the loop wires are sealed in the pavement.

C. Test Equipment. Conduct tests using one or more loop tester devices capable of measuring continuity, inductance in microhenrys (μH), integrity of the wire insulation in mega-ohms (MΩ), loop wire resistance in ohms (Ω), and the Loop Quality Factor (Q).

D. Inductive Loop Tester:

1. Measure inductance.
2. Measure series resistance.
3. Measure Loop Quality Factor.

E. High voltage resistance tester:

1. Measure and record the insulation resistance (leakage to ground) of each loop assembly. Use a 500 VDC insulation megger to measure the resistance. Reference all measurements to a good earth ground (ground rod, metallic water pipe, etc.). Disconnect the transient suppression devices from the loop assemblies before taking any measurements.

F. Acceptable test results.

1. Inductance (L): The inductance reading on the loop tester is within 10 percent of the Department's calculated value.
2. Series resistance (R): Less than or equal to 10 Ω at the Controller.
3. Loop Quality Factor (Q): Greater than 5.
4. Insulation Resistance: Greater than 100 MΩ.

G. Corrective Actions:

1. Perform, at no additional cost to the Department and to the satisfaction of Engineer, all corrective actions necessary to obtain acceptable test results, as stipulated in the preceding Subarticle, and meet all requirements of these Specifications.
2. If the series resistance of a loop assembly is greater than 10 Ω, inspect the loop assembly to find the cause of the excessive resistance. Correct the cause of the excessive resistance at no additional cost to the Department.
3. If the insulation resistance is less than or equal to 100 MΩ, determine if the lead-in cable or the loop wire is causing the problem, and replace the defective cable or loop wire at no additional cost to the Department.

H. Turn On Requirements. Connect the loop assemblies to the appropriate inductive loop vehicle detectors and tune the detectors in accordance with the manufacturer's instructions. Separate the operating frequencies of vehicle detectors, in adjacent lanes, by at least 2 kHz.

3.03 VEHICLE PRESENCE DETECTOR PERFORMANCE REQUIREMENTS

A. Vehicle Presence Detection System Field Acceptance Testing:

1. Ensure presence detectors provide a minimum detection accuracy of 98%. Ensure presence detectors meet the requirements for modes of operation in NEMA TS2-2016, 6.5.2.17.
2. Verify detection accuracy at installed field sites using a reduced method to that described in FDOT Specification Section 660-2.2 (Vehicle Presence Detection Performance Requirements). Compare sample data collected from the detection system with ground truth data collected by human observation. For site acceptance tests, collect samples and ground truth data for each site for a minimum of five minutes during a peak period and five minutes during an off-peak period. For presence detection at intersections, ensure there are a minimum of three detections for each signal phase. Perform site acceptance tests in the presence of Engineer.

3.04 TRAFFIC DATA DETECTOR PERFORMANCE REQUIREMENTS:

A. Traffic Data Detection System Field Acceptance Testing:

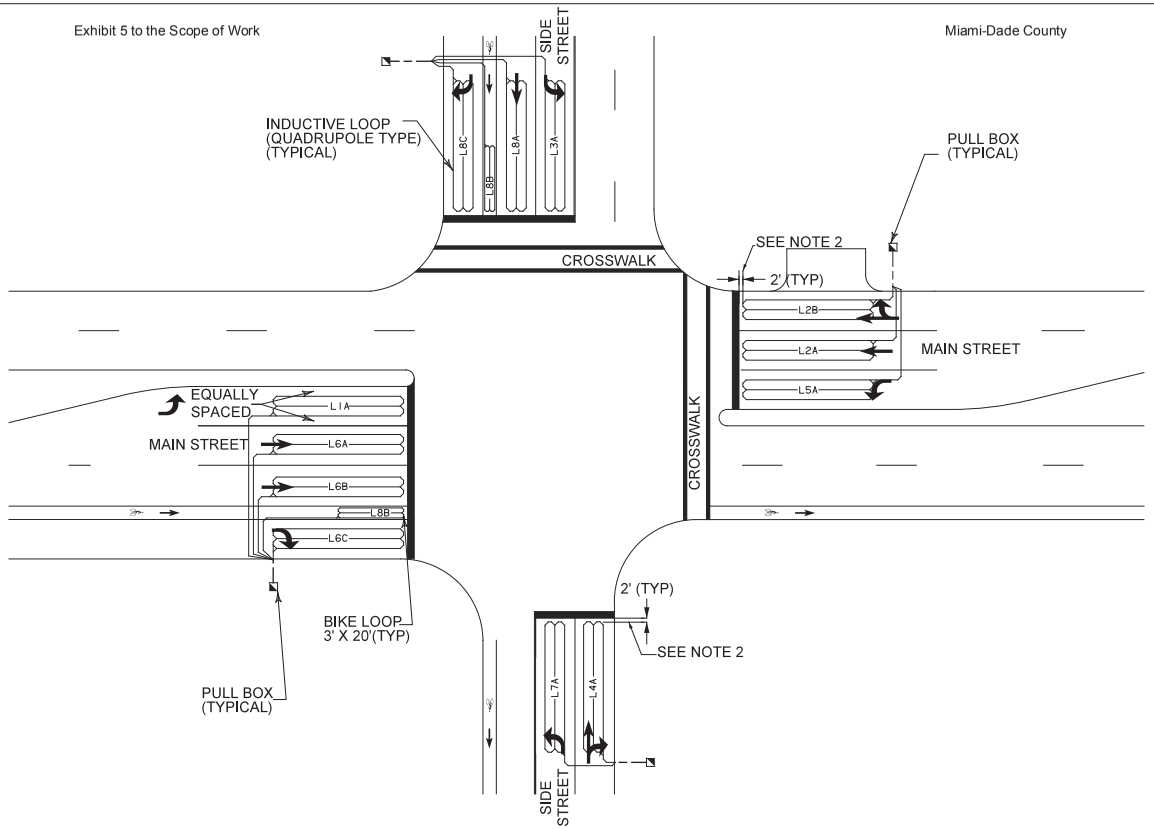
1. Vehicle detection system must be capable of meeting the minimum total roadway segment accuracy levels of 95% for volume, 90% for occupancy, and 90% for speed for all lanes, up to the maximum number of lanes that the device can monitor as specified by the manufacturer.
2. Verify detection accuracy at installed field sites using a reduced method to that described in FDOT Specification Section 660-2.3 (Traffic Data Detection System Performance Requirements). Compare sample data collected from the detection system with ground truth data collected by human observation. For site acceptance tests, collect samples and ground truth data for each site for a minimum of five minutes during a peak period and five minutes during an off-peak period. Perform site acceptance tests in the presence of the Engineer.

3.05 AVI DETECTION SYSTEM PERFORMANCE REQUIREMENTS:

A. AVI detectors must meet the performance requirements described in FDOT Specification Section 660-2.4 (Probe Data Detection Performance Requirements).

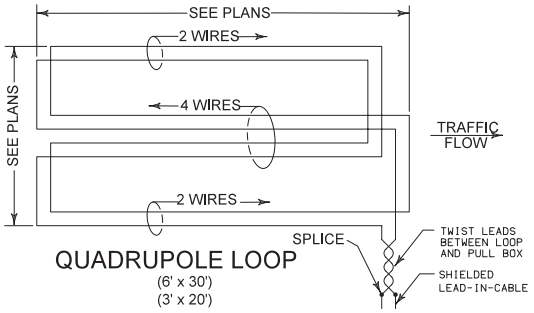
B. Calculation of AVI Detection System Speed and Travel Time Accuracy: Calculate speed and travel time accuracy by comparing the speeds and travel times reported by the system against ground truth collected through human observation or another method approved by Engineer.

END OF SECTION 660



TYPICAL INDUCTIVE LOOP PLACEMENT

NOT TO SCALE

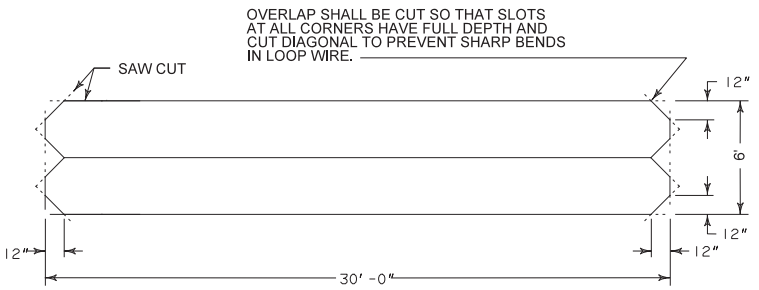


QUADRUPOLE LOOP

(6' x 30')
(3' x 20')

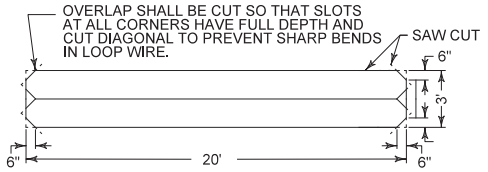
TYPICAL DETECTOR LOOP WIRE CONFIGURATION

NOT TO SCALE



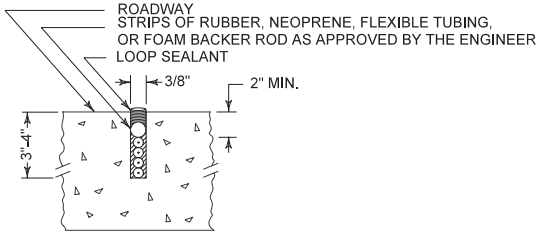
TYPICAL "TYPE F" VEHICLE INDUCTIVE LOOP

NOT TO SCALE



TYPICAL "TYPE F" MODIFIED BICYCLE INDUCTIVE LOOP

NOT TO SCALE



LOOP SECTION

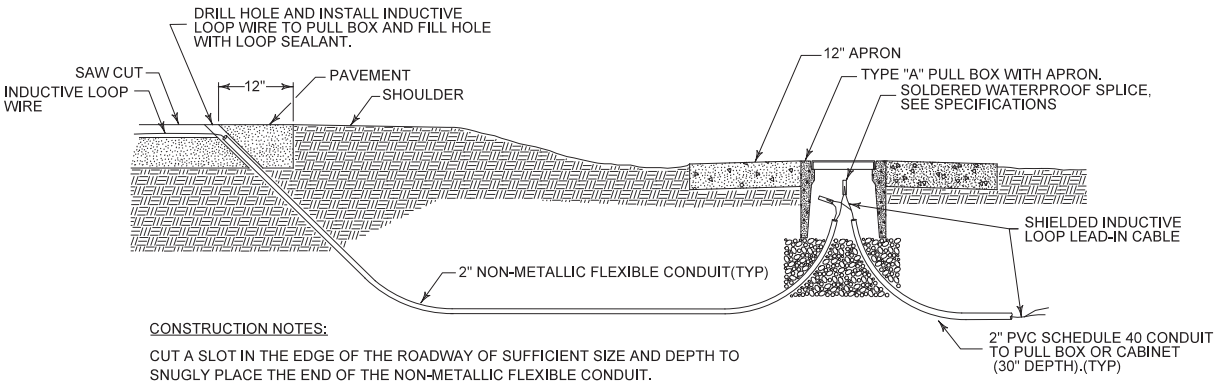
NOT TO SCALE

TYPICAL SAW CUT DETAIL

MDC204

LATEST REVISION	DESCRIPTION:	TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS	MIAMI-DADE	DTPW TRAFFIC SIGNALS AND SIGNS DIVISION 7100 NW 36th STREET MIAMI, FLORIDA 33166 305.592.3580		NAME	DATE
03/27/17					DRAWN BY:	TRAVIS BREWER	09-29-16
					CHECKED BY:	NAHUM FERNANDEZ	03-22-17
					APPROVED BY: FRANK AIRA, P.E.		

TYPICAL INDUCTIVE LOOP INSTALLATION DETAILS (N.T.S.)

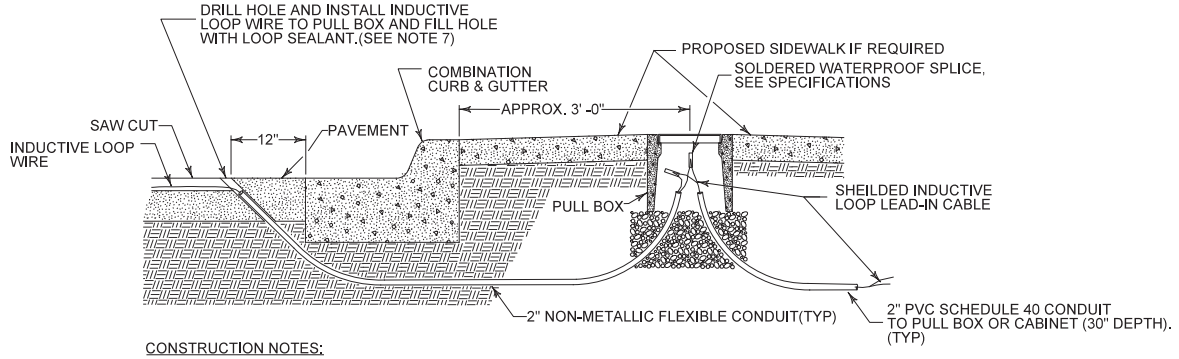


CONSTRUCTION NOTES:

CUT A SLOT IN THE EDGE OF THE ROADWAY OF SUFFICIENT SIZE AND DEPTH TO SNUGLY PLACE THE END OF THE NON-METALLIC FLEXIBLE CONDUIT. THE END OF THE CONDUIT SHALL BE AT LEAST 12" INTO THE ROADWAY AND 3" BELOW THE TOP OF THE ROADWAY SURFACE. THE DEPARTURE ANGLE OF THE CONDUIT FROM THE ROADWAY SHALL BE 30 TO 45 DEGREES.

TYPICAL SECTION VIEW OF INDUCTIVE LOOP WIRE THROUGH PAVEMENT TO PULL BOX.

NOT TO SCALE



CONSTRUCTION NOTES:

DRILL A HOLE 1/2" TO 1" LARGER IN DIAMETER THAN THE FLEXIBLE CONDUIT TO BE USED THROUGH THE ROADWAY ASPHALT (OR CONCRETE) SURFACE AND BASE AT AN APPROPIATE ANGLE TO INTERCEPT THE TRENCH OR PULL BOX HOLE. PLACE A PREDETERMINED LENGTH OF NON-METALLIC FLEXIBLE CONDUIT IN THE HOLE AND DRIVE THE CONDUIT INTO THE TRENCH OR HOLE. THE TOP OF THE CONDUIT SHALL BE APPROXIMATELY 3" BELOW THE ROADWAY SURFACE. FILL THE HOLE WITH LOOP SEALANT TO THE LEVEL OF THE ROADWAY SURFACE. A NONMETALLIC MATERIAL SHOULD BE USED TO PREVENT EXCESSIVE LOOP SEALANT FROM ENTERING THE NON-METALLIC FLEXIBLE CONDUIT.

TYPICAL SECTION VIEW OF INDUCTIVE LOOP WIRE THROUGH CURB TO PULL BOX.

NOT TO SCALE

GENERAL NOTES:

1. MEET THE REQUIREMENTS OF MIAMI-DADE COUNTY TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS SECTION 660 (VEHICLE DETECTION SYSTEMS).

2. THE STANDARD PLACEMENT OF THE LEADING EDGE OF TYPE F LOOP IS TWO FEET BEFORE THE STOP BAR BUT MAY EXTEND A MAXIMUM OF 10 FEET PAST THE STOP BAR TO MEET SITE-SPECIFIC ENGINEERING REQUIREMENTS. EACH INTERSECTION MUST BE INDIVIDUALLY DESIGNED AND IF THE AFOREMENTIONED MODIFICATION IS REQUIRED IT MUST BE NOTED OR DETAILED IN THE PLANS.UNDER NO CIRCUMSTANCES MAY THE LOOP OR SAW-CUT ENCROACH INTO A CROSSWALK.

3. IF THE LOOP LEAD-IN IS 75' OR LESS FROM THE EDGE OF THE LOOP DETECTOR TO CONTROLLER CABINET, CONTINUE THE TWISTED PAIR TO THE CABINET. IF THE LOOP LEAD-IN IS GREATER THAN 75' CONTINUE THE TWISTED PAIR TO THE SPECIFIED PULL BOX, SPLICE TO SHIELDED LEAD-IN WIRE AND CONTINUE TO THE CONTROLLER CABINET.

4. THE WIDTH OF ALL SAW CUTS SHALL BE SUFFICIENT TO ALLOW UNFORCED PLACEMENT OF LOOP WIRES OR LEAD-IN CABLES INTO THE SAW CUT. THE DEPTH OF ALL SAW CUTS, EXCEPT ACROSS EXPANSION JOINTS SHALL BE STANDARD 3 INCHES WITH A MAXIMUM OF 4 INCHES.

5. LOOP LEAD-IN WIRES MUST NOT BE INSTALLED IN THE SAME PULL BOX WITH SIGNAL POWER CABLES.

6. THE MINIMUM DISTANCE BETWEEN THE TWISTED PAIRS OF LOOP LEAD-IN WIRE IS 6 INCH FROM THE LOOP TO 12 INCH FROM THE PAVEMENT EDGE OR CURB.

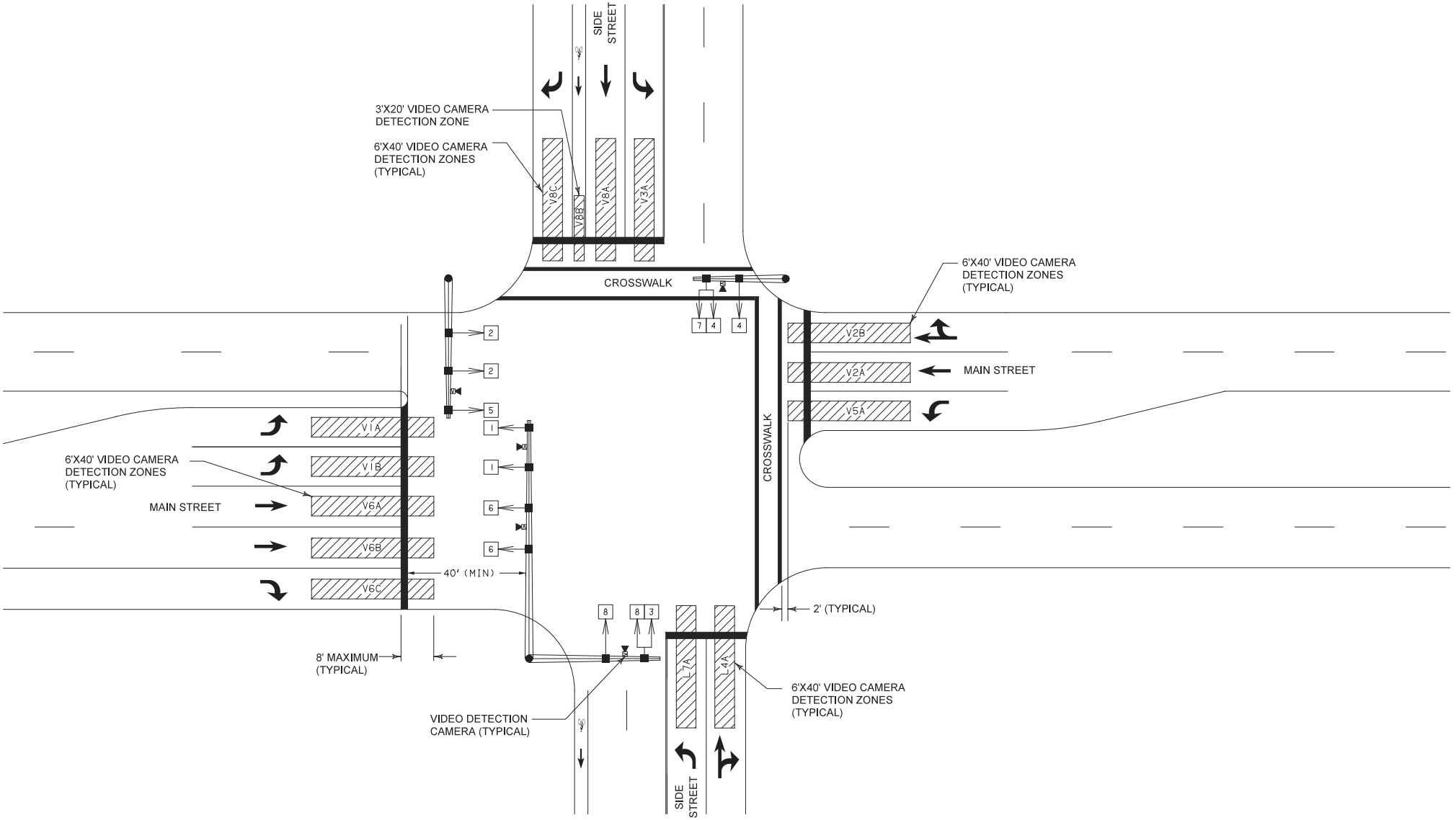
7. THE MAXIMUM AREA OF ASPHALT TO BE DISTURBED SHALL BE 4"X 4". THIS AREA SHALL BE RESTORED AS DIRECTED BY THE ENGINEER.

8. LOOP LEAD-IN WIRES MUST BE 6 INCHES APART WHERE THERE ARE MULTIPLE LOOPS.

MDC205

LATEST REVISION	DESCRIPTION:	TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS	MIAMI-DADE	DTPW TRAFFIC SIGNALS AND SIGNS DIVISION 7100 NW 36th STREET MIAMI, FLORIDA 33166 305.592.3580		NAME	DATE	TYPICAL INDUCTIVE LOOP INSTALLATION DETAILS (N.T.S.)	SHEET NO.
03/27/17					DRAWN BY	TRAVIS BREWER	09-29-16		2 of 2
					CHECKED BY	NAHUM FERNANDEZ	03-22-17		
					APPROVED BY: FRANK AIRA, P.E.				

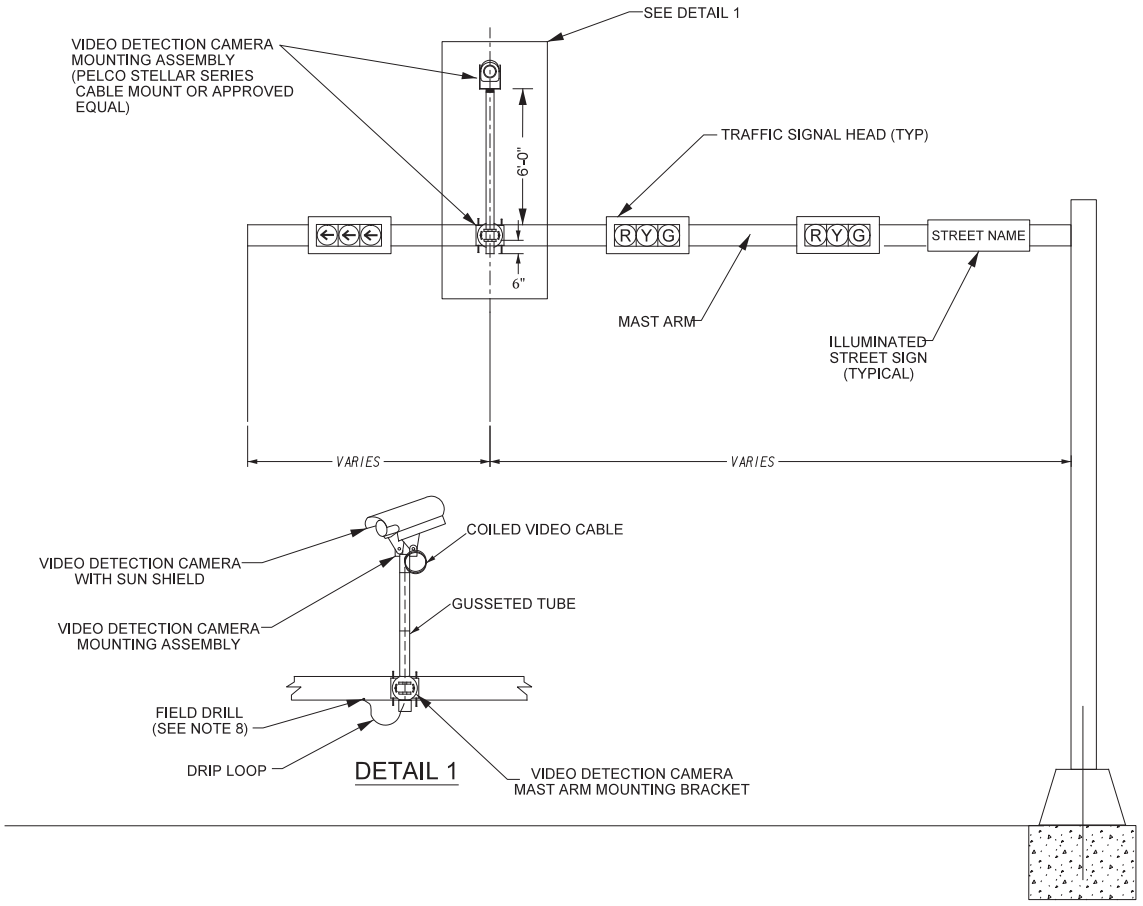
TYPICAL VIDEO DETECTION CAMERA LOCATION DETAIL



MDC206

LATEST REVISION	DESCRIPTION:	TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS	MIAMI-DADE	DTPW TRAFFIC SIGNALS AND SIGNS DIVISION 7100 NW 36th STREET MIAMI, FLORIDA 33166 305.592.3580		NAME	DATE	VIDEO VEHICLE DETECTION DETAILS (N.T.S.)	SHEET NO.
03/27/17					DRAWN BY	TRAVIS BREWER	09-29-16		1 of 2
					CHECKED BY	NAHUM FERNANDEZ	03-22-17		
					APPROVED BY: FRANK AIRA, P.E.				

TYPICAL MAST ARM VIDEO DETECTOR MOUNTING DETAILS



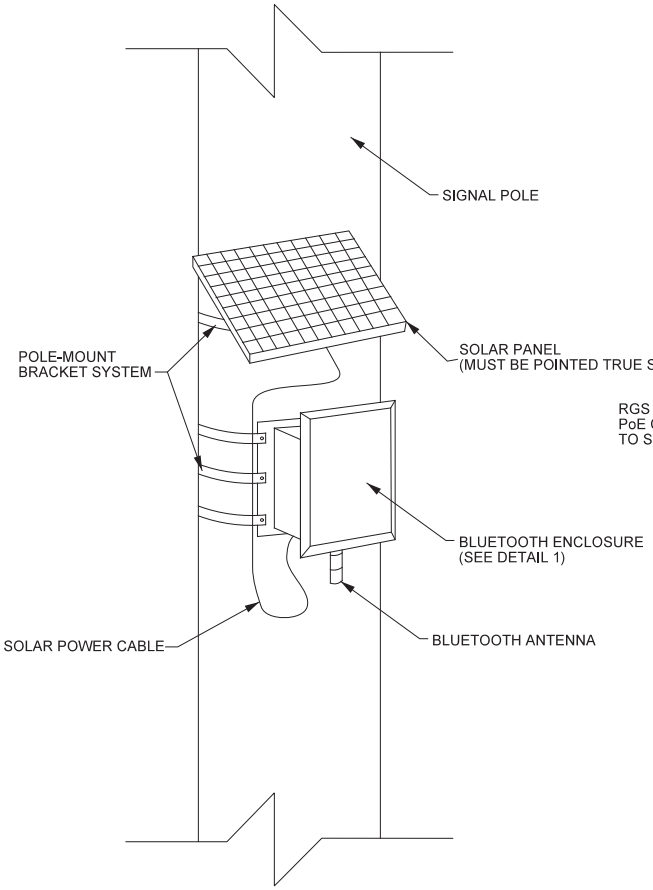
GENERAL NOTES:

1. MEET THE REQUIREMENTS OF MIAMI-DADE COUNTY TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS SECTION 660 (VEHICLE DETECTION SYSTEMS). EACH INTERSECTION MUST BE INDIVIDUALLY DESIGNED TO INCLUDE SITE-SPECIFIC EQUIPMENT PLACEMENT REQUIREMENTS AND DETECTION ZONE REQUIREMENTS.
2. REFER TO FDOT'S APPROVED PRODUCT LIST (APL) AND THE MIAMI-DADE COUNTY TRAFFIC SIGNALS AND SIGNS DIVISION'S QUALIFIED PRODUCT LIST FOR VIDEO DETECTOR SYSTEMS AND MOUNTING HARDWARE APPROVED FOR USE IN MIAMI-DADE COUNTY SUBMIT SHOP DRAWINGS FOR APPROVAL BEFORE INSTALLATION.
3. TYPICAL INSTALLATION WILL REQUIRE ONE CAMERA PLACED ON THE LANE LINE BETWEEN THE INBOARD THROUGH LANE AND LEFT TURN LANE.
4. APPROACHES WITH MORE THAN FOUR LANES REQUIRE TWO CAMERAS PER APPROACH. COUNT BICYCLE LANES AS HALF A LANE. WHEN USING TWO CAMERAS, PLACE ONE BETWEEN THE LEFT LANES AND THE OTHER IN A POSITION THAT CENTERS THE CAMERA TO COVER ALL THE THROUGH LANES. THE CAMERA MUST BE ORIENTED SO THAT THE STOP BAR IS PARALLEL WITH THE BOTTOM OF THE IMAGE.
5. WHEN PROPOSED VIDEO DETECTION CAMERAS ARE LOCATED AT A HORIZONTAL DISTANCE FROM 40 TO 100 FEET FROM THE STOP BAR AND NUMBER OF APPROACH LANE EXCEED THREE (OR 33 FEET TOTAL WIDTH), INDIVIDUAL VIDEO CAMERAS MUST BE INSTALLED FOR EACH CONTROLLER TIMING FUNCTION.
6. CHECK FOR ANYTHING THAT MIGHT BLOCK THE FIELD OF VIEW OR IMPACT VEHICLE TRACKING SUCH AS TREES, OVERHEAD WIRES, AND COMMERCIAL LIGHT SOURCES
7. REVIEW THE PLACEMENT OF THE VIDEO IMAGE DETECTION DEVICES AND COORDINATE WITH THE ENGINEER OF RECORD TO CONFIRM THE MOST OPTIMAL LOCATION FOR THE INSTALLATION OF THE VIDEO IMAGE DETECTION DEVICES IN ORDER TO MEET THE PERFORMANCE REQUIREMENTS OF THE TECHNICAL SPECIFICATIONS OF AN APPROVED PRODUCT.
8. CONCEAL CAMERA CABLE(S) THROUGH THE MOUNT'S GUSSETED TUBE AND NEATLY PLACE DRIP LOOP INTO THE MAST ARM MINIMIZING EXPOSED CABLE(S). WIRE ACCESS HOLE MUST NOT EXCEED ONE INCH IN DIAMETER AND MUST INCLUDE A RUBBER GROMMET. DRILL HOLE AS TO NOT DAMAGE EXISTING SIGNAL CABLES. UTILIZE EXISTING ACCESS WHEREVER POSSIBLE.
9. MEET ALL GROUNDING AND SURGE PROTECTIVE DEVICE (SPD) REQUIREMENTS OF SECTION 620 OF THE FDOT STANDARD SPECIFICATIONS.
10. MAKE THE VIDEO DETECTION SYSTEM OPERATIONAL IMMEDIATELY UPON INSTALLATION, REMOVING THE ASSOCIATED MINOR MOVEMENTS FROM RECALL
11. ZOOM AND FOCUS THE CAMERA TO INCLUDE ALL TRAVEL LANES REQUIRING DETECTION. HORIZON MUST NOT BE VISIBLE IN THE IMAGE.
12. ALL OSHA CLEARANCE REQUIREMENTS FOR MAINTAINING SAFE DISTANCES TO OVERHEAD ELECTRIC FACILITIES WHILE PERFORMING CAMERA MAINTENANCE SHALL BE ACHIEVED BY CORRECT CAMERA PLACEMENT.LOCATE AND ANGLE CAMERAS TAKING INTO CONSIDERATION ITS RELATION TO THE RISING AND SETTING SUN TO BEST AVOID "SUNBURST" AND "WHITEOUT" EFFECTS DEMONSTRATED ON WET ROADWAYS.
13. ALL EXTERIOR VIDEO CABLE FITTINGS SHALL HAVE A WATER AND WEATHER-PROOF BOOT.
14. CAMERA TERMINALS THAT REQUIRE CABLE SPLICING IN THE FIELD MUST BE MADE WITH MECHANIC CONNECTORS OR TERMINAL LUGS NO ELECTRICAL WIRE NUTS WILL BE ALLOWED AS A MEANS OF TERMINATION.
15. SIGNAL CONTRACTOR IS RESPONSIBLE FOR INITIAL DETECTION ZONE SET-UP. COORDINATE WITH MIAMI-DADE COUNTY PRIOR TO SET-UP.
16. VIDEO DETECTION SET-UP WILL BE SUCH THAT NO FALSE OR DROPPED CALLS ARE OBSERVED.
17. DETECTION ZONE OUTPUT MUST BE PROGRAMMED TO CALL APPROPRIATE TIMING PHASES ASSIGNED TO CAMERA APPROACH. ONE VIDEO PROCESSOR CARD PER CAMERA. ONE DETECTION ZONE PER LANE ON APPROACH.
18. ALL MINIMUM REQUIREMENTS LISTED ABOVE MUST BE DEMONSTRATED PRIOR TO FINAL ACCEPTANCE OF ANY VIDEO DETECTION SYSTEM INSTALLATION.

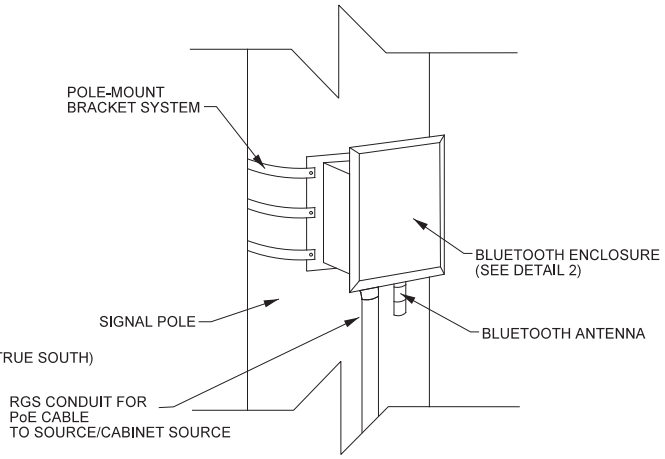
MDC207

LATEST REVISION	DESCRIPTION:	TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS	MIAMI-DADE	DTPW TRAFFIC SIGNALS AND SIGNS DIVISION 7100 NW 36th STREET MIAMI, FLORIDA 33166 305.592.3580		NAME	DATE	VIDEO VEHICLE DETECTION DETAILS (N.T.S.)	SHEET NO.
03/27/17					DRAWN BY	TRAVIS BREWER	09-29-16		2 of 2
					CHECKED BY	NAHUM FERNANDEZ	03-22-17		
					APPROVED BY: FRANK AIRA, P.E.				

TYPICAL AUTOMATIC VEHICLE INDENTIFICATION (BLUETOOTH) MOUNTING DETAILS



SOLAR POWER



POWER OVER ETHERNET
(PoE)

GENERAL NOTES:

1. MEET THE REQUIREMENTS OF MIAMI-DADE TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS SECTION 660 (VEHICLE DETECTION SYSTEM)

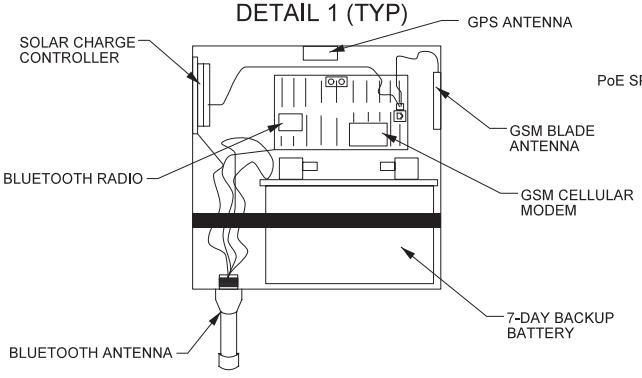
2. THE CONTRACTOR SHALL REFER TO THE FDOT'S APPROVED PRODUCT LIST (APL) AND THE MIAMI-DADE COUNTY QUALIFIED PRODUCT LIST SECTION 660 FOR AUTOMATIC VEHICLE IDENTIFICATION AND ALL MOUNTING HARDWARE APPROVED FOR USE IN MIAMI-DADE COUNTY AND SUBMIT SHOP DRAWINGS FOR APPROVAL BEFORE INSTALLATION. DRAWINGS MUST DEPICT THE APPROVED SOURCE/CABINET SOURCE FOR PoE.

3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW THE PLACEMENT OF THE AUTOMATIC VEHICLE IDENTIFICATION (BLUETOOTH) DEVICES AND COORDINATE WITH THE ENGINEER OF RECORD TO DETERMINE THE MOST OPTIMAL LOCATION FOR THE INSTALLATION OF THE REQUIREMENTS OF THE TECHNICAL SPECIFICATIONS OF AN APPROVED PRODUCT.

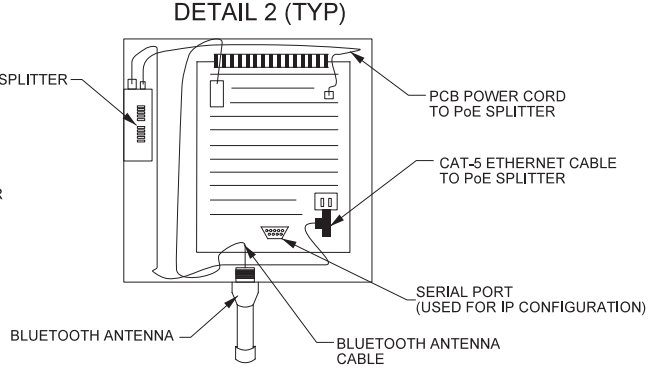
4. THE AUTOMATIC VEHICLE INDENTIFCATION (BLUETOOTH) DEVICE SHOULD BE PLACED 12' ABOVE GROUND LEVEL.

MDC208

DETAIL 1 (TYP)



DETAIL 2 (TYP)



LATEST REVISION	DESCRIPTION:	TRAFFIC CONTROL EQUIPMENT STANDARDS AND SPECIFICATIONS	MIAMI-DADE	DTPW TRAFFIC SIGNALS AND SIGNS DIVISION 7100 NW 36th STREET MIAMI, FLORIDA 33166 305.592.3580		NAME	DATE	TYPICAL AUTOMATIC VEHICLE IDENTIFICATION (BLUETOOTH) MOUNTING DETAILS (N.T.S.)	SHEET NO.
03/27/17					DRAWN BY	TRAVIS BREWER	09-29-16		1 of 1
					CHECKED BY	NAHUM FERNANDEZ	03-22-17		
					APPROVED BY: FRANK AIRA, P.E.				

Exhibit 6

Traffic Control Equipment Standards and Specifications
Section 671 (Traffic Signal Controllers)

SECTION 671
TRAFFIC SIGNAL CONTROLLERS

PART 1 GENERAL

1.01 SUMMARY

A. Description

1. Furnish and install a Caltrans Model 2070LX advanced transportation controller as required by the Contract Documents.

1.02 REFERENCES

A. Traffic Control Equipment Specifications and Standards for Metro Traffic Control System, Miami-Dade County

B. California Department of Transportation (Caltrans) Transportation Electrical Equipment Specifications (TEES), 2020 and Errata

C. ATC 5201 v06.25: Advanced Transportation Controller (ATC) Standard Version 06

D. National Transportation Communications for ITS Protocol (NTCIP) 1202: Object Definitions for Actuated Traffic Signal Controller (ASC) Units V02.19

E. FDOT Standard Specifications for Road and Bridge Construction, Section 671 – Traffic Controllers

F. Florida Department of Transportation Approved Products List (APL)

G. Miami-Dade County Traffic Signals and Signs Division's Qualified Products List (TSSQPL)

H. Caltrans' Traffic Signal Control Equipment Qualified Products List (QPL)

I. National Electrical Manufacturers Association (NEMA) TS 2-2021

1.03 SYSTEM DESCRIPTION

A. General Requirements

1. Controllers must provide functionality that meets or exceeds operational characteristics, including NTCIP support, as described in NEMA TS 2-2021.

2. Controllers must capture all mandatory event-based data elements listed in the FDOT State Traffic Engineering and Operations Office supplemental requirements for controllers (*SR-671-2, Supplemental Traffic Controller High Resolution Data Logging Requirements).* Controllers must provide all event-based data elements listed in the FDOT State Traffic Controller High Resolution Data Logging Requirements without any missing data.

3. Controller software must meet or exceed the requirements of the Miami-Dade Traffic Signal Controller Local Software Specifications maintained by the Miami-Dade County Department of Transportation and Public Works (the Department).

1.04 SUBMITTALS

A. Certificates

1. The traffic controller submittal information must include certificates or other documented evidence that the 2070LX controller provided is approved and listed on the Caltrans QPL, FDOT APL, and TSSQPL.

B. Manufacturers' Instructions and Information

1. Submit or ensure that the following documentation from the manufacturer has been submitted to the Department:
   a. Operation Manual
   b. Troubleshooting and Service Manual
   c. Assembly and installation instructions
   d. Pictorial layout of components and schematics for circuit boards
   e. Parts list
2. Electronic copies of all documentation must be provided. Electronic documentation must not require licenses, fees, or additional purchase for duplication or distribution.

1.05 DELIVERY STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading

1. If the traffic controller is not packaged and shipped as part of a traffic controller assembly, ensure it is packaged in a manufacturer provided box and handled as per manufacturer's handling, storage, and protection requirements.

1.06 WARRANTY

A. Ensure the traffic controller has a manufacturer's warranty covering defects for three years from the date of final acceptance. Ensure the warranty includes providing replacements within 10 calendar days of notification for defective parts and equipment during the warranty period at no cost to the Department.

1.07 OWNER'S INSTRUCTIONS

A. Manufacturers' instructions and information documentation provided must describe all controller features and operations, including all user interfaces and settings required to configure the traffic controller.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Controller must meet the latest Caltrans TEES requirements for a 2070LX Traffic Signal Controller unit and include, at minimum, the unit chassis, 2070-1C CPU, 2070-2E+ field I/O module, 2070-3B Front Panel, and 2070- 4A Power Supply.

B. Controller must be approved and listed on the:

1. Caltrans' QPL as a Model 2070LX Controller Unit,

2. Florida Department of Transportation's APL, and

3. Miami-Dade County Traffic Signals and Signs Division's TSSQPL.

C. Ensure equipment is permanently marked with the manufacturer's name or trademark, part number, and serial number. Controller serial number must be readily visible without putting the intersection into a flash operation.

2.02 EXTRA MATERIALS

A. A spare Data Key and a spare 2070-2E+ module must be provided for every ten traffic controllers supplied.

B. A physical set of controller schematics and a repair manual must be provided for everyone hundred (100) traffic controllers supplied.

2.03 ACCESSORIES

A. The controller must be provided with all accessories and incidental material necessary for installation and operation in a Miami-Dade traffic controller cabinet including, but not limited to, mounting hardware, power cable, data key, and interface card such that installation into the Miami-Dade cabinet does not require any additional components.

2.04 SOURCE QUALITY CONTROL

A. Tests, Inspections

1. Provide all documentation related to manufacturer Quality Assurance/Quality Control with regards to the controller, including batch/lot information as applicable, to the Department.

PART 3 EXECUTION

3.01 PREPARATION

A. Equipment

1. Verify the controller to be installed appears undamaged and in good working conditions prior to installation.
2. Confirm that controller has been pre-programmed for site-specific operation and has passed all testing and verification requirements necessary for field deployment including establishing communication between the controller and central software.
3. When replacing an existing controller, observe and document the current operational status of the intersection prior to controller replacement.

B. Site Condition

1. Preparation for controller replacement
   a. Allow all stacked traffic to clear side streets.
   b. Wait until main street is on green and traffic moving.
   c. Ensure that pedestrians and other traffic in crosswalks have safely crossed the street. Place intersection in flash.

3.02 INSTALLATION

A. General

1. Install equipment as shown in the plans and according to the manufacturer's recommendations.

B. Removal

1. After verifying Flash control at intersection, turn off controller power, remove power cord, field I/O (C1) and communication (Ethernet/Serial) from the existing Traffic Controller.
2. Remove hardware retaining the Traffic Controller in rack.
3. Carefully remove existing Traffic Controller, ensure no wires are pinched or pulled from their current location.

C. Replacement

1. Carefully install the new Traffic Controller, ensure no wires are pinched or pulled from their connection.
2. Connect power, field I/O, and communication; Verify calls from detectors.
3. Using proper hardware, secure Traffic Controller into cabinet rack. Controller assembly includes all integration by the Contractor that is necessary for the proper operation of the controller assembly in the signal system.
4. Place intersection out of Flash and back in Traffic Control.

3.03 FIELD QUALITY CONTROL

A. Site Tests, Inspection

1. Ensure the intersection is functioning properly following controller installation, including verification that all vehicle and pedestrian detectors are properly mapped and placing calls to the traffic controller, and that all signals are operating properly.

END OF SECTION 671

Exhibit 7

Traffic Signal Controller Local Software Functional and Performance Specification

Miami-Dade Traffic Signal Controller Local Software

Functional and Performance Specification

1. Introduction

1.1. Purpose

1.1.1. This specification describes the features and functional requirements for Miami-Dade Traffic Signal Controller Local Software. The controller software must be a Commercially- available Off-The-Shelf (COTS) product designed for operation in County-approved Caltrans Model 2070LX traffic signal controllers. The controller software must be compatible with the central traffic management system software used by the Miami-Dade County Department of Transportation and Public Works (DTPW) Traffic Management Center (TMC).

1.2. Controller software overview

1.2.1. The controller software must be a COTS product from the traffic controller manufacturer designed to run on a Linux operating system and 2070LX hardware platform compliant with MDC traffic signal controller hardware specifications and Caltrans TEES 2020 requirements including all Errata for a 2070LX Traffic Signal Controller unit. In addition, the controller software shall be compatible with Advanced Transportation Controllers meeting the requirements of ATC 5201 Advanced Transportation Controller Standard v06A.

1.3. Software attributes

1.3.1. Compatibility and Standards Conformance

1.3.2. The controller software must operate on the Miami-Dade County network and not interfere with other systems. The controller software must be compatible with all 170 type cabinets, including, but not limited to the existing Miami-Dade County MD-552 and MD-660 series controller cabinets, Caltrans model cabinets, and Advanced Transportation Controller cabinets (ATC 5301 v02.02).

1.3.3. The controller software must fully support the controller requirements of Caltrans TEES 2020 2070LX, ATC 5201 Advanced Transportation Controller Standard v06 (v06A.37), and these Specifications.

1.3.4. The controller software must provide functionality that meets or exceeds operational characteristics, including National Transportation Communications for ITS (Intelligent Transportation Systems) Protocol (NTCIP) support, as described in National Electrical Manufacturers Association (NEMA) TS-2-2021.

1.3.5. The controller software must support all mandatory traffic signal controller requirements and objects defined in NTCIP 1202 as well as Appendix A, Miami-Dade Traffic Signal Controller NTCIP requirements.

1.3.6. The controller software must not rely upon proprietary objects or protocols for communications or operational.

1.3.7. Controller software must be provided with the entire MIB in electronic and hard copy. Controller software use must include rights to re-use/redistribute the entire MIB including any extensions as necessary to communicate to the Central Software.

1.3.8. The controller software must be fully functional, compatible, and readily loadable onto all Model 2070LX controllers listed on the Miami-Dade County Traffic Signals and Signs Division Qualified Products List.

1.4. Reliability

1.4.1. The controller software must include features that help achieve high reliability, such as modularity, backup, and recovery. Storage and backup functions/alarms to be saved for a minimum of 30 days.

1.5. Support and maintenance

1.5.1. The controller software license must provide Miami-Dade County with proven and tested updates at no cost for as long as the controller hardware is supported by its manufacturer.

1.5.2. Any update on the controller software must not inadvertently affect any software functions that are not the defined target of the update. Verification testing must include all controller functions.

2. General and Administrative

2.1. Intersection Information

2.1.1. The controller software must be able to display real-time intersection information including: date and time, phase, operating mode, preemption, detector status, alarms and coordination status.

2.1.2. The controller software must allow the user to view software, I/O map, and operating system (linux) version information.

2.2. Software Updates

2.2.1. The controller software must permit authorized users to update the operating system and traffic signal application via USB and laptop computer.

2.2.2. The controller software must permit authorized users to update the operating system and traffic signal application via remote operations. Updates using remote operations must not cause the signal to go into flash.

2.3. Security and Programming

2.3.1. The controller software must allow programming locally via the display panel, locally via USB, locally via Data Key, locally via a laptop PC by a serial or Ethernet cable, and remotely from a Central ATMS software via NTCIP commands.

2.3.2. The controller software must allow administrators to set multiple user IDs with unique passcodes.

2.3.3. The controller software must provide a minimum of 3 security levels (e.g., Administrator, read-write for configuration settings except user IDs and passcodes, and read-only).

2.3.4. The controller software must reside in non-volatile flash memory.

2.3.5. The controller software must check file compatibility and integrity of updates prior to implementation.

2.3.6. The controller software must advance security features as per the Caltrans TEES 2020 specification.

2.4. Copy/Cut/Paste

2.4.1. The controller software must support central software user ability to copy data from one phase, timing plan, detector plan, detector options, pattern, or sequence or any other programmable value to another like feature to facilitate programming where values are the same.

2.4.2. The controller software must provide the ability to create and store a backup database that can be used to restore a controller or program a new controller.

2.5. Changing and Saving Controller Settings

2.5.1. The controller software must prompt the user to confirm changes prior to committing them to the controller database for implementation.

2.5.2. The controller software must highlight changes to settings prior to committing them to the controller database for implementation.

2.5.3. The controller software must prompt the user prior to activating changes.

2.5.4. The controller software must have capability to upload and download controller database via USB and data key.

2.5.5. The controller software must have capability to upload and download controller database remotely.

2.5.6. The controller software must have the ability to perform automatic periodic database backups.

2.5.7. The controller software must log all changes performed by the users.

2.5.8. The data key must be capable of automatically updating itself every one (1) hour. If the controller needs an additional key for the Adaptive system, it needs to be different and distinguished from the controller key.

3. Signal Control

3.1. Display

3.1.1. Display menu must provide access to control all programmable features. All display menu access must follow the security and programming section, which requires user secure credentials to access and make any edits from the display menu.

3.1.2. The controller software must include a help system that provides information regarding the currently active menu or selected parameter.

3.2. Phase Sequence and Rings

3.2.1. The controller software must support programming up to sixteen phases for vehicles.

3.2.2. The controller software must support programming up to sixteen phases for pedestrians.

3.2.3. The controller software must support up to sixteen configurable phase sequences.

3.2.4. The controller software must support up to four rings.

3.2.5. The controller software must be able to turn on and turn off exclusive pedestrian phases by TOD/DOW/Temporary time base schedule commands which will time and display pedestrian

indications with vehicle movements remaining in all red. The temporary time base requires development.

3.2.6. The controller software must be able to replicate the operation of existing functions, including special functions. the programming of such functions must be equal or better of the existing system, including the reliability, maintainability, portability, supportability, and usability equal to or better than the existing system.

3.2.7. The controller software must allow the pedestrian phases (Walk, Flash Don't Walk) to be fully served during normal operation and during transition between phase banks.

3.3. Input and Output Assignments

3.3.1. I/O mapping and pin assignment must meet standard C1 connector and terminal specifications from Miami Dade cabinet configuration as noted below.

3.3.1.1. Pin 49 - Spare is Reserved

3.3.1.2. Pin 50 - Spare is Reserved

3.3.1.3. Pin 53 - Spare is Reserved

3.3.1.4. Pin 54 - Spare is Reserved

3.3.1.5. Pin 66 - Pretime is Reserved

3.3.1.6. Pin 68 - Spare Input is Reserved

3.3.1.7. Pin 91 - Spare.

3.3.2. Only one (1) I/O map and pin assignment to be used and deployed for all the controllers in Miami-Dade County. The use of multiple I/O map software is not allowed on this project.

3.3.3. The controller software must allow authorized users to modify/assign all inputs and outputs.

3.3.4. The controller software must support flashing yellow arrow operation.

3.3.5. The controller must support Pedestrian Hybrid Beacon operation.

3.4. Programmable Logic

3.4.1. The controller software must support logic commands including AND, OR, NOR and NAND, and latching operations.

3.4.2. Logic gates must support delay and extension timing for all inputs and outputs.

3.5. Startup Operations

3.5.1. The controller software startup conditions are configurable to include a user defined all- red or flash interval.

3.5.2. The controller software must permit users to assign startup phases, flash duration, all red duration, side street green, main street green, and vehicle and pedestrian calls on startup.

3.6. Phase Timing Parameters

3.6.1. The controller software must permit unique timing parameters and allow users to define minimum and maximum green time and secondary maximum green time, yellow clearance time, and red clearance time for any phase.

3.6.2. The controller software must allow users to define secondary maximum green time for any phase.

3.6.3. The signal controller software must permit users to define the amount of time necessary between detector actuations to cause a gap out for any phase.

3.6.4. The signal controller software must permit users to define the duration of Flashing Don't Walk time for any phase and must allow the users to include the clearance time if pedestrian operation is negative to overlaps.

3.6.5. The controller software must support rest in walk, advance and delay pedestrian walk, flashing don't walk time and green time.

3.6.6. The controller software must support gap reduction and dynamic max limit defined by user.

3.6.7. The controller software must support conditional service and phase conditional re-service for any phase.

3.6.8. The controller software must be capable of providing a Leading Pedestrian Interval.

3.6.9. The controller software must be capable of providing minimum green time for overlaps.

3.7. Phase Option Parameters

3.7.1. The controller software must support phase omit per TOD/DOW.

3.7.2. The controller software must support minimum and maximum recall for any active phase per TOD/DOW.

3.7.3. The controller software must prevent a yellow trap via detector switching or similar option.

3.8. Overlaps

3.8.1. The controller software must support programming up to sixteen overlaps for vehicles.

3.8.2. The controller software must support programming up to sixteen overlaps for pedestrians.

3.8.3. The controller software must support negative (or minus) pedestrian overlap which allows the controller to serve a pedestrian phase without starting the conflicting overlap until the programmed pedestrian phase has completed to solid don't walk. If the overlap is already on when a pedestrian phase should be serviced, the pedestrian phase will be delayed until the conflicting overlap is terminated.

3.8.4. The controller software must be able to time green, yellow, and all red times.

3.8.5. The signal controller software must permit users to define compatible and incompatible phases with overlaps.

3.8.6. The controller software must maintain uninterrupted operation of standard overlaps during normal operation and coordination. The controller software must prevent premature termination of overlaps that have negative pedestrian modifiers and ensure the minimum green time requirements are fulfilled.

3.8.7. The controller must support programming of guaranteed minimums for overlaps (Green, Walk, Ped, yellow, and red).

3.9. Detectors

3.9.1. The controller software must support a minimum of 64 vehicle detectors and 16 pedestrian detectors.

3.9.2. The signal controller software must provide a minimum of 3 unique sets of detectors parameters.

3.9.3. The signal controller software must allow users to assign attributes to each vehicle and pedestrian detectors and use it as counting detectors.

3.9.4. The controller must support detector set switching by TOD for special functions.

3.10. Coordination

3.10.1. Coordination functions to control intersection cycle lengths, system offset relationships, and phase split percentages are provided as a standard feature, with no need for additional modules or software.

3.10.2. Coordination, Time of Day, and external alternate sequence can alter the standard phase by selecting a configurable sequence.

3.10.3. Offset correction/transition mode and maximum number of cycles defined by user.

3.10.4. The controller software provides configurable minimum values for green, walk, pedestrian clearance, yellow clearance, red clearance and overlap. These values cannot be changed by the controller.

3.11. Date and Time Functions

3.11.1. The controller software must include a clock that keeps track of the current date and time. Ensure the clock can be configured to a local time based on the time zone offset and be remotely set. The controller software must be able to be synchronize with the central server time. Additionally, the controller software must support automatic synchronization throughout the day (e.g., minimum of every 4 hour intervals or lesser).

3.11.2. Controller software must support scheduling based on time of day and external triggering. The scheduler must permit the user to define the months, days of week, and date of month for assigned day plans.

3.11.3. The scheduler must permit users to define and use time-of-day for functions including, but not limited to timings, coordination patterns, detector plans, automatic flash, and special functions.

3.11.4. The controller software must be able to adjust daylight saving time automatically including leap year added extra day.

3.12. Preemption and Priority

3.12.1. The controller software must provide control to enable or disable preemption by plan or phase. The controller software must include a user configurable duration and sequence that the preemption signal is active prior to initiating the signal preemption. Preemption duration must be configurable.

3.12.1.1. The controller software must permit the user to define an all red state prior to entering preemption.

3.12.1.2. The controller software must allow the user to define preemption exit settings, including phases for exiting preemption and the recovery period.

3.12.1.3. The preemption priority must allow “nested” preemption.

3.12.2. Emergency Preemption

3.12.2.1. The controller software must support a minimum of eight preemption sequences without requiring additional software or hardware.

3.12.3. Transit/Bus Priority

3.12.3.1. The controller software must support a minimum of ten bus or other low-priority preemption sequences without requiring additional software or hardware.

3.12.3.2. The controller software must provide a minimum of 4 set of TSP strategy parameters and 16 TSP strategies.

3.12.3.3. The controller software must be compatible with all South Dade Busway intersections.

3.13. Controller Event Logs

3.13.1. The controller software must include an event log buffer capable of storing a minimum of 30 days, of time and date-stamped high resolution events or alarms. Once logged, events remain in the buffer until cleared or the log buffer capacity is exceeded. When capacity is reached, events are over-written by the first-in first-out method.

3.13.2. The controller software must permit users to collect events and alarm data remotely and export data to USB in a readable format.

3.13.3. The controller software must include logs of local access to controller consisting of at a minimum but not limited to personnel that accessed, date, time and changes made. The controller software must transmit these events to the central or saved for at least six (6) months.

3.14. Communication

3.14.1. The controller software must support communication via Ethernet and Serial interfaces. Ethernet interfaces must be able to provide ICMP Echo Replies to ICMP Echo Requests.

3.14.2. The controller software must allow the network ports to be configurable to the MDC needs.

3.15. Front Panel Interface

3.15.1. The controller software must provide a menu-based front panel user interface using the controller front panel display and keypad controls.

3.15.2. The front panel interface must permit authorized users to read, enter, modify, and save edit all programmable controller settings.

3.15.3. The controller software must provide different users security levels thought front panel.

3.15.4. The front panel must return to a user-definable state after a user-specified amount of time with no front panel activity.

3.15.5. The controller software must permit authorized users to update the database via laptop computer or through the communications system. The controller software must log all changes for at a minimum

of six (6) months. The changes recorded must at a minimum include but not limited to user ID, date, time, and changes made.

4. Peer-to-Peer Operation

4.1.1. General

4.1.1.1. The controller software must provide Peer-to-Peer operation that allows controllers to share information over an Ethernet network between intersections. The controller software must allow programming of peer-to-peer functions, including the identification of peer controllers by IP address.

4.1.1.2. The provided data must include phases, plan, flash, TSP and signal status, detectors, logic gates, preemption and input/output pins.

5. Central System Compatibility

5.1. Miami-Dade County Central Traffic Management System Software

5.1.1. The controller software must be compatible with Miami-Dade Central Traffic Management System Software.

5.1.2. The controller software must support adaptive traffic control and connected vehicle applications.

5.2. NTCIP-Compliant Central Management Systems

5.2.1. The controller software must be NTCIP compliant in accordance with these specifications.

APPENDIX A
MIAMI-DADE TRAFFIC SIGNAL CONTROLLER NTCIP REQUIREMENTS

PART 1 GENERAL

This document defines National Transportation Communications for ITS Protocol (NTCIP) requirements for actuated traffic signal controller (ASC) units. Please note that if the group is mandatory, then all objects within that group listed as mandatory shall be supported. If the ASC does not support the functionality associated with a specific object or group of objects, yet still meets Florida Department of Transportation (FDOT) and Miami-Dade County specifications, then the device must respond with a noSuchName error response when requests are made for those objects.

PART 2 NTCIP REQUIREMENTS

Table 1: Abbreviations used in this document

Abbreviation	Description
M	*Mandatory*
O	*Optional*
D	*Deprecated*

Table 2: Supplemental Traffic Signal Controller NTCIP Requirements Table

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
Phase Parameters	**NTCIP 1202v02.19 2.2**	**M Group**	
maxPhases	2.2.1	M	
phaseTable	2.2.2	M	
phaseEntry		M	
phaseNumber	2.2.2.1	M	
phaseWalk	2.2.2.2	M	
phasePedestrianClear	2.2.2.3	M	
phaseMinimumGreen	2.2.2.4	M	
phasePassage	2.2.2.5	M	
phaseMaximum1	2.2.2.6	M	
phaseMaximum2	2.2.2.7	M	
phaseYellowChange	2.2.2.8	M	
phaseRedClear	2.2.2.9	M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
phaseRedRevert	2.2.2.10	M	
phaseAddedInitial	2.2.2.11	M	
phaseMaximumInitial	2.2.2.12	M	
phaseTimeBeforeReduction	2.2.2.13	M	
phaseCarsBeforeReduction	2.2.2.14	M	
phaseTimeToReduce	2.2.2.15	M	
phaseReduceBy	2.2.2.16	M	
phaseMinimumGap	2.2.2.17	M	
phaseDynamicMaxLimit	2.2.2.18	M	
phaseDynamicMaxStep	2.2.2.19	M	
phaseStartup	2.2.2.20	M	
phaseOptions	2.2.2.21	M	
phaseRing	2.2.2.22	M	
phaseConcurrency	2.2.2.23	M	
maxPhaseGroups	2.2.3	M	
phaseStatusGroupTable	2.2.4	M	
phaseStatusGroupEntry		M	
phaseStatusGroupNumber	2.2.4.1	M	
phaseStatusGroupReds	2.2.4.2	M	
phaseStatusGroupYellows	2.2.4.3	M	
phaseStatusGroupGreens	2.2.4.4	M	
phaseStatusGroupDontWalks	2.2.4.5	M	
phaseStatusGroupPedClears	2.2.4.6	M	
phaseStatusGroupWalks	2.2.4.7	M	
phaseStatusGroupVehCalls	2.2.4.8	M	
phaseStatusGroupPedCalls	2.2.4.9	M	
phaseStatusGroupPhaseOns	2.2.4.10	M	
phaseStatusGroupPhaseNexts	2.2.4.11	M	
phaseControlGroupTable	2.2.5	M	
phaseControlGroupEntry		M	
phaseControlGroupNumber	2.2.5.1	M	
phaseControlGroupPhaseOmit	2.2.5.2	M	
phaseControlGroupPedOmit	2.2.5.3	M	
phaseControlGroupHold	2.2.5.4	M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
phaseControlGroupForceOff	2.2.5.5	M	
phaseControlGroupVehCall	2.2.5.6	M	
phaseControlGroupPedCall	2.2.5.7	M	
Detector Parameters	**2.3**	**M Group**	
maxVehicleDetectors	2.3.1	M	
vehicleDetectorTable	2.3.2	M	
vehicleDetectorEntry		M	
vehicleDetectorNumber	2.3.2.1	M	
vehicleDetectorOptions	2.3.2.2	M	
vehicleDetectorCallPhase	2.3.2.3	M	
vehicleDetectorSwitchPhase	2.3.2.4	M	
vehicleDetectorDelay	2.3.2.5	M	
vehicleDetectorExtend	2.3.2.6	M	
vehicleDetectorQueueLimit	2.3.2.7	M	
vehicleDetectorNoActivity	2.3.2.8	M	
vehicleDetectorMaxPresence	2.3.2.9	M	
vehicleDetectorErraticCounts	2.3.2.10	M	
vehicleDetectorFailTime	2.3.2.11	M	
vehicleDetectorAlarms	2.3.2.12	M	
vehicleDetectorReportedAlarms	2.3.2.13	M	
vehicleDetectorReset	2.3.2.14	M	
maxVehicleDetectorStatusGroups	2.2.3	M	
vehicleDetectorStatusGroupTable	2.3.4	M	
vehicleDetectorStatusGroupEntry		M	
vehicleDetectorStatusGroupNumber	2.3.4.1	M	
vehicleDetectorStatusGroupActive	2.3.4.2	M	
vehicleDetectorStatusGroupAlarms	2.3.4.3	M	
Volume/Occupancy Report	2.3.5	M	
volumeOccupancySequence	2.3.5.1	M	
volumeOccupancyPeriod	2.3.5.2	M	
activeVolumeOccupancyDetectors	2.3.5.3	M	
volumeOccupancyTable	2.3.5.4	M	
volumeOccupancyEntry		M	
detectorVolume	2.3.5.4.1	M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
detectorOccupancy	2.3.5.4.2	M	
maxPedestrianDetectors	2.3.6	M	
pedestrianDetectorTable	2.3.7	M	
pedestrianDetectorEntry		M	
pedestrianDetectorNumber	2.3.7.1	M	
pedestrianDetectorCallPhase	2.3.7.2	M	
pedestrianDetectorNoActivity	2.3.7.3	M	
pedestrianDetectorMaxPresence	2.3.7.4	M	
pedestrianDetectorErraticCounts	2.3.7.5	M	
pedestrianDetectorAlarms	2.3.7.6	M	
Unit Parameters	**2.4**	**M Group**	
unitStartUpFlash	2.4.1	M	
unitAutoPedestrianClear	2.4.2	M	
unitBackupTime	2.4.3	M	
unitRedRevert	2.4.4	M	
unitControlStatus	2.4.5	M	
unitFlashStatus	2.4.6	M	
unitAlarmStatus2	2.4.7	M	
unitAlarmStatus1	2.4.8	M	
shortAlarmStatus	2.4.9	M	
unitControl	2.4.10	M	
maxAlarmGroups	2.4.11	M	
alarmGroupTable	2.4.12	M	
alarmGroupEntry		M	
alarmGroupNumber	2.4.12.1	M	
alarmGroupState	2.4.12.2	M	
maxSpecialFunctionOutputs	2.4.13	M	
specialFunctionOutputTable	2.4.14	M	
specialFunctionOutputEntry		M	
specialFunctionOutputNumber	2.4.14.1	M	
specialFunctionOutputState	2.4.14.1	D	
specialFunctionOutputControl	2.4.14.3	M	
specialFunctionOutputStatus	2.4.14.4	M	
Coordination Parameters	**2.5**	**M Group**	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
coordOperationalMode	2.5.1	M	
coordCorrectionMode	2.5.2	M	
coordMaximumMode	2.5.3	M	
other(1)		O	
maximum1(2)		M	
maximum2(3)		M	
maxinhibit(4)		M	
coordForceMode	2.5.4	M	
other(1)		M	
floating(2)		M	
fixed(3)		M	
maxPatterns	2.5.5	M	
patternTableType	2.5.6	M	
other(1)		O	
patterns(2)		M	
offset3(3)		O	
offset5(4)		O	
patternTable	2.5.7	M	
patternEntry		M	
patternNumber	2.5.7.1	M	
patternCycleTime	2.5.7.2	M	
patternOffsetTime	2.5.7.3	M	
patternSplitNumber	2.5.7.4	M	
patternSequenceNumber	2.5.7.5	M	
maxSplits	2.5.8	M	
splitTable	2.5.9	M	
splitEntry		M	
splitNumber	2.5.9.1	M	
splitPhase	2.5.9.2	M	
splitTime	2.5.9.3	M	
splitMode	2.5.9.4	M	
other(1)		O	
none(2)		M	
minimumVehicleRecall(3)		M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
maximumVehicleRecall(4)		M	
pedestrianRecall(5)		M	
maximumVehicleAndPedestrainRecall(6)		M	
phaseOmitted(7)		M	
splitCoordPhase	2.5.9.5	M	
coordPatternStatus	2.5.10	M	
localFreeStatus	2.5.11	M	
coordCycleStatus	2.5.12	M	
coordSyncStatus	2.5.13	M	
systemPatternControl	2.5.14	M	
systemSyncControl	2.5.15	M	
Time Base Parameters	**2.6**	**M Group**	
timebaseAscPatternSync	2.6.1	M	
maxTimebaseAscActions	2.6.2	M	
timebaseAscActionTable	2.6.3	M	
timebaseAscActionEntry		M	
timebaseAscActionNumber	2.6.3.1	M	
timebaseAscPattern	2.6.3.2	M	
timebaseAscAuxiliaryFunction	2.6.3.3	M	
timebaseAscSpecialFunction	2.6.3.4	M	
timebaseAscActionStatus	2.6.4	M	
Preempt Parameters	**2.7**	**M Group**	
maxPreempts	2.7.1	M	
preemptTable	2.7.2	M	
preemptEntry		M	
preemptNumber	2.7.2.1	M	
preemptControl	2.7.2.2	M	
preemptLink	2.7.2.3	M	
preemptDelay	2.7.2.4	M	
preemptMinimumDuration	2.7.2.5	M	
preemptMinimumGreen	2.7.2.6	M	
preemptMinimumWalk	2.7.2.7	M	
preemptEnterPedClear	2.7.2.8	M	
preemptTrackGreen	2.7.2.9	M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
preemptDwellGreen	2.7.2.10	M	
preemptMaximumPresence	2.7.2.11	M	
preemptTrackPhase	2.7.2.12	M	
preemptDwellPhase	2.7.2.13	M	
preemptDwellPed	2.7.2.14	M	
preemptExitPhase	2.7.2.15	M	
preemptState	2.7.2.16	M	
preemptTrackOverlap	2.7.2.17	M	
preemptDwellOverlap	2.7.2.18	M	
preemptCyclingPhase	2.7.2.19	M	
preemptCyclingPed	2.7.2.20	M	
preemptCyclingOverlap	2.7.2.21	M	
preemptEnterYellowChange	2.7.2.22	M	
preemptEnterRedClear	2.7.2.23	M	
preemptTrackYellowChange	2.7.2.24	M	
preemptTrackRedClear	2.7.2.25	M	
preemptControlTable	2.7.3	M	
preemptControlEntry		M	
preemptControlNumber	2.7.3.1	M	
preemptControlState	2.7.3.2	M	
Ring Parameters	**2.8**	**M Group**	
maxRings	2.8.1	M	
maxSequences	2.8.2	M	
sequenceTable	2.8.3	M	
sequenceEntry		M	
sequenceNumber	2.8.3.1	M	
sequenceRingNumber	2.8.3.2	M	
sequenceData	2.8.3.3	M	
maxRingControlGroups	2.8.4	M	
ringControlGroupTable	2.8.5	M	
ringControlGroupEntry		M	
ringControlGroupNumber	2.8.5.1	M	
ringControlGroupStopTime	2.8.5.2	M	
ringControlGroupForceOff	2.8.5.3	M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
ringControlGroupMax2	2.8.5.4	M	
ringControlGroupMaxInhibit	2.8.5.5	M	
ringControlGroupPedRecycle	2.8.5.6	M	
ringControlGroupRedRest	2.8.5.7	M	
ringControlGroupOmitRedClear	2.8.5.8	M	
ringStatusTable	2.8.6	M	
ringStatusEntry		M	
ringStatus	2.8.6.1	M	
Channel Parameters	**2.9**	**M Group**	
maxChannels	2.9.1	M	
channelTable	2.9.2	M	
channelEntry		M	
channelNumber	2.9.2.1	M	
channelControlSource	2.9.2.2	M	
channelControlType	2.9.2.3	M	
other(1)		O	
phaseVehicle(2)		M	
phasePedestrian(3)		M	
overlap(4)		M	
channelFlash	2.9.2.4	M	
channelDim	2.9.2.5	M	
maxChannelStatusGroups	2.9.3	M	
channelStatusGroupTable	2.9.4	M	
channelStatusGroupEntry		M	
channelStatusGroupNumber	2.9.4.1	M	
channelStatusGroupReds	2.9.4.2	M	
channelStatusGroupYellows	2.9.4.3	M	
channelStatusGroupGreens	2.9.4.4	M	
Overlap Parameters	**2.10**	**M Group**	
maxOverlaps	2.10.1	M	
overlapTable	2.10.2	M	
overlapEntry		M	
overlapNumber	2.10.2.1	M	
overlapType	2.10.2.2	M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
overlapIncludedPhases	2.10.2.3	M	
overlapModifierPhases	2.10.2.4	M	
overlapTrailGreen	2.10.2.5	M	
overlapTrailYellow	2.10.2.6	M	
overlapTrailRed	2.10.2.7	M	
maxOverlapStatusGroups	2.10.3	M	
overlapStatusGroupTable	2.10.4	M	
overlapStatusGroupEntry		M	
overlapStatusGroupNumber	2.10.4.1	M	
overlapStatusGroupReds	2.10.4.2	M	
overlapStatusGroupYellows	2.10.4.3	M	
overlapStatusGroupGreens	2.10.4.4	M	
TS2 Port 1 Parameters	**2.11**	**O Group**	**Note: None of the objects under 2.11 are required.**
maxPort1Addresses	2.11.1	M	
port1Table	2.11.2	M	
port1Entry		M	
port1Number	2.11.2.1	M	
port1DevicePresent	2.11.2.2	M	
port1Frame40Enable	2.11.2.3	M	
port1Status	2.11.2.4	M	
port1FaultFrame	2.11.2.5	M	
ASC Block Objects	**2.12**	**O Group**	**Note: None of the objects under 2.12 are required.**
ascBlockGetControl	2.12.1	M	
ascBlockData	2.12.2	M	
ascBlockErrorStatus	2.12.3	M	
GLOBAL CONFIGURATION NODE	**NTCIP 1201v03.15r 2.2**	**M Group**	
globalSetIDParmeter	2.2.1	M	
globalMaxModules	2.2.2	M	
globalModuleTable	2.2.3	M	
moduleTableEntry		M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
moduleNumber	2.2.3.1	M	
moduleDeviceNode	2.2.3.2	M	
moduleMake	2.2.3.3	M	
moduleModel	2.2.3.4	M	
moduleVersion	2.2.3.5	M	
moduleType	2.2.3.6	M	
controller-baseStandards	2.2.4	M	
GLOBAL DATABASE MANAGEMENT NODE	**2.3**	**M Group**	
dbCreateTransaction	2.3.1	M	
dbVerifyStatus	2.3.6	M	
dbVerifyError	2.3.7	M	
GLOBAL TIME MANAGEMENT NODE	**2.4**	**M Group**	
globalTme	2.4.1	M	
globalDayLightSaving	2.4.2	M	
timebase	2.4.3	M	
maxTimeBaseScheduleEntries	2.4.3.1	M	
timeBaseScheduleTable	2.4.3.2	M	
timeBaseScheduleEntry		M	
timeBaseScheduleNumber	2.4.3.2.1	M	
timeBaseScheduleMonth	2.4.3.2.2	M	
timeBaseScheduleDay	2.4.3.2.3	M	
timeBaseScheduleDate	2.4.3.2.4	M	
timeBaseScheduleDayPlan	2.4.3.2.5	M	
timeBaseScheduleTable-status	2.4.3.3	M	
maxDayPlans	2.4.4.1	M	
maxDayPlanEvents	2.4.4.2	M	
timeBaseDayPlanTable	2.4.4.3	M	
timeBaseDayPlanEntry		M	
dayPlanNumber	2.4.4.3.1	M	
dayPlanEventNumber	2.4.4.3.2	M	
dayPlanHour	2.4.4.3.3	M	
dayPlanMinute	2.4.4.3.4	M	
dayPlanActionNumberOID	2.4.4.3.5	M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
dayPlanStatus	2.4.4.4	M	
globalTimeDifferential	2.4.5	D	
controller-standardTimeZone	2.4.6	M	
controller-localTime	2.4.7	M	
SNMP Group	**RFC1213**	**M Group**	
snmpInPkts	snmp.1	M	
snmpOutPkts	snmp.2	M	
snmpInBadVersions	snmp.3	M	
snmpInBadCommunityNames	snmp.4	M	
snmpInBadCommunityUses	snmp.5	M	
snmpInASNParseErrs	snmp.6	M	
snmpInTooBigs	snmp.8	M	
snmpInNoSuchNames	snmp.9	M	
snmpInBadValues	snmp.10	M	
snmpInReadOnlys	snmp.11	M	
snmpInGenErrs	snmp.12	M	
snmpInTotalReqVars	snmp.13	M	
snmpInTotalSetVars	snmp.14	M	
snmpInGetRequests	snmp.15	M	
snmpInGetNexts	snmp.16	M	
snmpInSetRequests	snmp.17	M	
snmpInGetResponses	snmp.18	M	
snmpInTraps	snmp.19	O	
snmpOutTooBigs	snmp.20	O	
snmpOutNoSuchNames	snmp.21	M	
snmpOutBadValues	snmp.22	M	
snmpOutGenErrs	snmp.24	M	
snmpOutGetRequests	snmp.25	M	
snmpOutGetNexts	snmp.26	M	
snmpOutSetRequests	snmp.27	M	
snmpOutGetResponses	snmp.28	M	
snmpOutTraps	snmp.29	O	
snmpEnableAuthenTraps	snmp.30	O	
System Group	**RFC1213**	**M Group**	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
sysDescr	system 1	M	
sysObjectID	system 2	M	
sysUpTime	system 3	M	
sysContact	system 4	M	
sysName	system 5	M	
sysLocation	system 6	M	
sysServices	system 7	M	
STMP Group	**NTCIP 1103-A.5**	**M Group**	
Dynamic Object Definition	A.5.1	M	
dynObjDef		M	
dynObjEntry		M	
dynObjNumber		M	
dynObjIndex		M	
dynObjVariable		M	
Dynamic Object Configuration	A.5.3	M	
dynObjConfigTable		M	
dynObjConfigEntry		M	
dynObjConfigOwner		M	
dynObjConfigStatus		M	
STMP Statistics	A.5.4	M	
stmp-InPkts	.1	M	
stmp-OutPkts	.2	M	
stmp-InParseErrs	.6	M	
stmp-InTooBigs	.8	M	
stmp-InNoSuchNames	.9	M	
stmp-InBadValues	.10	M	
stmp-InReadOnlys	.11	M	
stmp-InGenErrs	.12	M	
stmp-InGetRequests	.15	M	
stmp-InGetNexts	.16	M	
stmp-InSetRequests	.17	M	
stmp-InGetResponses	.18	M	
stmp-OutTooBigs	.20	M	

Conformance Group / Object Name	Reference	Miami-Dade Requirement	Additional Notes and Requirements
stmp-OutNoSuchNames	.21	M	
stmp-OutBadValues	.22	M	
stmp-OutReadOnly	.23	M	
stmp-OutGenError	.24	M	
stmp-OutGetRequests	.25	M	
stmp-OutGetNexts	.26	M	
stmp-OutSetRequests	.27	M	
stmp-OutGetResponses	.28	M	
stmp-OutTrapResponses	.29	M	
stmp-InSetRequestsNoReply	.31	M	
stmp-InSetResponses	.32	M	
stmp-InErrorResponses	.33	M	
stmp-OutSetRequestsNoReply	.34	M	
stmp-OutSetResponses	.35	M	
stmp-OutErrorResponses	.35	M	
STMP Configuration	A.5.5	M	
dynamicObjectPersistence	.1	M	
dynamicObjectTable-ConfigID	.2	M	

Exhibit 8

Miami-Dade Central Traffic Management System Software Functional and Performance Specification

Miami-Dade Central Traffic Management System Software
Functional and Performance Specification

1. Introduction

1.1 Purpose

1.1.1 This specification describes the features and functional requirements of a commercially-available off-the-shelf (COTS) central traffic management system software for the Miami-Dade County Traffic Management Center located at 7100 NW 36th Street.

1.2 System overview

1.2.1 The central traffic management system software must support transportation system management and operations of 3,200 intersections, including active arterial management, and be scalable to accommodate future growth of intersections and other devices.

1.2.2 The software must be a scalable Windows-based COTS Advanced Traffic Management System (ATMS) client-server software package from a traffic controller manufacturer. The minimum system hardware and software configuration provided must support monitoring and management of at a minimum of 4,000 controllers as well as concurrent system operation and user access from a minimum of 50 clients at the same time without performance degradation. The software must be capable to accommodate future growth over the next two decades. The system must be able to handle increased volumes of traffic data, traffic controllers, and users as the network grows.

1.2.3 Server software must be designed to run on the Windows Server operating system (Windows Server 2019 and newer). Client workstation software must be designed to run on Microsoft Windows 10 Professional and newer. Databases must utilize Microsoft SQL 2019 and newer.

1.2.4 Software system attributes

1.2.4.1 Compatibility

1.2.4.1.1 The software must operate on the Miami-Dade County network and not interfere with other controller software systems or other systems.

1.2.4.2 Reliability and Data Integrity

1.2.4.2.1 The software design must include features that help achieve high availability, such as load balancing, modularity, redundancy, backup and recovery, ability to run in a virtual server environment, and failure detection. Frequent weekly server or service restarts should not be required.

1.2.4.2.2 The system must automatically log application failures and notify users via email.

1.2.4.2.3 The system must have a disaster recovery plan in the event of a catastrophic event.

1.2.4.3 Support and maintenance

1.2.4.3.1 The software license must provide Miami-Dade County with central system software updates for the major release supplied at no cost for as long as the release is supported by the vendor.

1.2.4.3.2 The system must allow automatic update of workstation client software without any user interference or configuration to the current version when a user login occurs from that workstation.

1.2.4.3.3 The system must allow automatic update of workstation client software including the un-installation of any previous version of the software automatically/silently without user interaction.

1.2.4.4 The system shall not limit the number of user accounts that can be defined.

2. Display and System Functions

2.1 General

2.1.1 The software must provide integrated intersection control and traffic management functions.

2.1.2 The software must support integrated corridor management strategies in response to changing traffic conditions.

2.2 Interfaces

2.2.1 Center to Field Communications

2.2.1.1 The software must operate properly using the Miami-Dade County wide area network (WAN) for center to field communications. The software must provide full functionality using County WAN Ethernet connectivity that includes, but is not limited to, fiber optic interconnect and cellular communications.

2.2.1.2 Device Support

2.2.1.2.1 The software must fully integrate with County- approved Caltrans Model 2070LX traffic signal controllers using the National Transportation Communication for ITS Protocol (NTCIP). The software must also support operation with NEMA TS2 controllers and ATC controllers listed on the Florida Department of Transportation Approved Product List (APL).

2.2.1.3 Protocol Support

2.2.1.3.1 The software must support use of NTCIP for all communication with field controllers and must support all mandatory NTCIP objects defined in NTCIP 1101 and NTCIP 1201 and all mandatory and optional traffic signal

controller requirements defined in NTCIP 1202. The system must comply with NTCIP standards for communication over TCP/IP.

2.2.1.3.2 The software MIBs and communication protocols must be non-proprietary.

2.2.2 Center to Center Communications

2.2.2.1 Protocol Support

2.2.2.1.1 The software MIBs and communication protocols used for center-to-center (C2C) communication must be non-proprietary.

2.2.2.1.2 The software vendor must provide technical documentation describing APIs, protocols, and software interfaces available for third-party data exchange and software development. This requirement must be at the County's discretion and or approval which 3rd party data is exchanged and used for software development.

2.2.2.1.3 The software must support use of NTCIP for center-to-center (C2C) communication.

2.2.2.2 Data sharing

2.2.2.2.1 The software must include a documented application programming interface (API) that allows data sharing and exchange with other systems and applications, such as external public traveler information systems. This requirement must be at the County's discretion and or approval which 3rd party data is exchanged and used for software development.

2.3 System Features and Functions

2.3.1 Device Configuration

2.3.1.1 The software must be capable of displaying all controller configuration values.

2.3.1.2 The software must allow users to open, review, modify, save, and edit all controller settings except I/O mapping.

2.3.1.3 The software must allow controller settings to be copied and pasted from one controller to another.

2.3.1.4 The software must provide configuration options to allow the user to add a new intersection using an existing intersection configuration as a starting point.

2.3.1.5 The software must include default patterns to use as a basis for developing plans using new cycle lengths, splits, and offsets.

2.3.1.6 The software must provide a warning to the user if a setting violates a rule or

conflicts with other settings e.g., cycle length is not equal to the total of the splits.

2.3.1.7 The software must accommodate exclusive pedestrian phases without compromising overlaps or other phases.

2.3.1.8 The software must allow complete and partial uploads and downloads from controller upon confirmation from the user to a system request.

2.3.1.9 The software must allow the user to upload, open, edit, store, and download all controller configuration parameters, including but not limited to: timing, overlaps, detectors, coordination parameters and settings, plans, controller configuration settings, clock settings, time of day settings, holiday settings, special event settings, and preemption settings.

2.3.1.10 Configuration changes associated with common operations, such as adding controllers or changing controller types, must not require a restart of ATMS central software components.

2.3.1.11 The software must retain a history of previous controller settings, including timings and the user who implemented it. The software must include a user configurable storage limit for controller history settings and other logs. Once limits are reached, logs are overwritten in a first-in first-out manner.

2.3.1.12 The software must allow creation of multiple draft copies of signal timings on any particular intersection in order to prepare for modifications, such as hardware and signal operating plan improvements, in advance of deployment and implementation to the intersection. The software must allow draft signal timings to be developed, evaluated, reviewed, and approved for an associated signal controller without impacting the current timings in service on that controller/intersection. Direct download of new signal timings and configuration changes shall not be allowed without a pop-up warning and operator verification step, including the ability to compare current settings to pending changes.

2.3.1.13 The software must support intersections with and without flashing yellow arrow (FYA) operation, diamond interchange operation, and bus priority functions.

2.3.2 Command and Control

2.3.2.1 The software must support all actuated control functions and operations described in the Manual on Uniform Traffic Control Devices (MUTCD) and NEMA TS2.

2.3.2.2 The software must provide manual command input which overrides normal signal operation.

2.3.2.3 The software must provide split monitor functionality including analysis of splits for a minimum of 14 calendar days.

2.3.2.4 The software must store a local copy of each controller’s configuration settings.

2.3.2.5 The software must allow authorized users to upload, modify, and download all controller configuration settings individually and in groups.

2.3.2.6 The software must include the ability to copy data from one phase, timing plan, detector plan, detector options, pattern, or sequence to another like feature to facilitate programming where values are the same.

2.3.2.7 The software must include functions for grouping signals for coordination and/or other purposes.

2.3.2.8 The software must provide ability for outside parties to work within system for timing development in an off-system work area to determine the effect the timing plan and coordination plans would have on the corridor.

2.3.3 Scheduling

2.3.3.1 The software must allow calendar scheduling of different functions and plans based on days of the year, time of day, day of week, special, and seasonal occurrence.

2.3.3.2 The software must allow operators to configure single and recurring events for each device managed by the system.

2.3.3.3 The software must notify operators of current events in effect and allow to save recurring events to be recalled and modified again.

2.3.4 Event Management and Notifications

2.3.4.1 The software must provide alerts with configurable alarm levels depending on user/group assignments and severity. Alerts must be able to automatically notify the appropriate personnel via email, text, or a combination of both when triggered. As the minimum, the alerts must include Asset #, location, timestamp UTC, time elapsed, issues and saved to a centralized database for POST evaluation and/or troubleshooting.

2.3.4.2 The software must be able to display an on-screen alert indicator, window, or pop-up alarm to notify operators of events when the user account has been configured to receive them.

2.3.4.3 The software must be able to provide notifications that alert operators to field controller events, including, but not limited to the following: cabinet door open, conflict flash, and preemption.

2.3.4.4 The software must provide at least 3 user configurable priority levels for alerts (e.g., low, medium, high).

2.3.4.5 The software must be able to require that users acknowledge high priority alarms. The software must log alarms and acknowledgements, including alarm information and user ID, date, and time of acknowledgement.

2.3.4.6 The software must allow unacknowledged alarms to be re-sent and escalated to other recipients based on configurable settings.

2.3.5 Workflow Support

2.3.5.1 The software must provide configurable workflow support, including the ability to submit system changes to the appropriate supervisor for approval before implementation.

2.3.5.2 Software workflows must route approval request notifications via E-mail, log the approval of system changes, and be able to prevent the download and implementation of proposed configuration changes that are not authorized and approved.

2.3.6 Asset Management

2.3.6.1 The software must include asset information and search capabilities.

2.3.7 Video Monitoring

2.3.7.1 The software must include features that allow unicast and multicast video streams monitoring of all intersections on the system.

2.3.7.2 The software must include a closed circuit television (CCTV) subsystem that allows users to monitor and control IP-based digital video detection cameras utilizing NTCIP and ONVIF. The software must support streaming of video with Motion JPEG, MPEG4 and
H.264 capabilities.

2.3.8 Other Device Control

2.3.8.1 The software must include the ability to integrate and control other ATMS-related field devices, such as dynamic message signs, using NTCIP and other industry-standard open protocols.

2.4 Graphical User Interface

2.4.1 General

2.4.1.1 The software must allow each user to configure and display views consisting of multiple windows.

2.4.1.2 The software must allow each user to save and retrieve custom layouts with user-definable window sizes and content selection.

2.4.1.3 The software must allow users to save and share views with other users so that they can be viewed on different workstations.

2.4.1.4 The software must allow each user to configure and set their own default display preferences. The user’s default display settings, including size of windows and displayed content, must be launched at the beginning of the user’s session.

2.4.1.5 The software must include the ability to display location and type of various ITS devices including at minimum video detection cameras and vehicle detection systems used for data collection, including detectors and links. The user interface must be context sensitive. For example, an event log of change history that is launched from a controller configuration screen should display change log data for only that particular controller.

2.4.1.6 The software must include “undo” and “redo” functions.

2.4.2 Main Map

2.4.2.1 Central software must support the display of GIS mapping integrated with device location and engineering zones boundaries.

2.4.2.2 All zoom levels must indicate the status of each intersection in real or near-real time and visual representation of coordination links between devices.

2.4.2.3 Zoom level increases must reveal additional details for intersections including, but not limited to: signal indication (red, yellow, green) intersection details, detector, phase, operating mode (e.g., Free, Coord, TOD, Manual, Failed, Flash), preemption, and coordination status and access to the report menu.

2.4.3 Intersection Displays

2.4.3.1 Real-time intersection graphic

2.4.3.1.1 The software must provide a real-time intersection graphic with an aerial view of the site and graphic overlays that display the current state of movements including signal colors or overlap status, active coordination pattern, active preemption status, pedestrian indications, communication status.

2.4.3.1.2 Display must provide a real-time intersection detector I/O for all detector and PED calls. Display includes fault and inoperative real-time status.

2.4.3.2 Real-time controller status display

2.4.3.2.1 The software must be able to update the status and timing values of all controllers at least once per second. The global update rate and the update rate used for each controller must be configurable.

2.4.4 Device Configuration Editor

2.4.4.1 The software must be able to provide read-only and read/write access to all programmable features within the controller based on user-specific privileges and/or system jurisdictions Coordination Displays

2.4.4.2 The software must include time/space diagrams with ability to display real-time, historical, and programmed timings for all intersections along the corridor.

2.4.4.3 Feedback must include progression and green band values for each direction.

2.4.4.4 The software must include a graphical representation and associated values of all timing phases.

2.4.4.5 Moving an intersection's offset must display the projected effect on the corridor.

2.4.4.6 The software must allow users to manipulate coordination settings by dragging the boundaries of graphical information presented on the time-space diagram. The software must prompt the user to confirm whether or not to save changes when the diagram is closed. If changes are made and saved to the central software database, the software must then prompt the user to select whether or not to immediately download and implement those changes to the associated controllers.

2.4.4.7 The display dialog must allow time/space modifications to be downloaded and implemented in field controllers in one action along the corridor. Must allow to reset the changes to previous settings.

2.4.4.8 The software must allow users to create multiple coordinated corridors for one intersection and define the coordinated phase as needed.

2.4.4.9 The display dialog must allow corridor speed limit values modifications "on the fly" to be downloaded and implemented in field controllers along the corridor.

2.4.5 Communication Status

2.4.5.1 The software must automatically monitor and provide real-time communications status, provide notifications when communication is lost and restored, be able to report link uptime, and maintain a log of communication-related events.

2.4.5.2 The software must provide a graphic display for communication performance based on dropped packages.

2.4.5.3 The software must provide a unified field form to automatically monitor and provide real-time signal status summary display for each intersection consisting of online status, communication failure, conflict, flash, police control, free, coordinated, transition, preemption, and maintain a log of status-related events. Real-time status of all intersections must be displayed in a single tabular form that is fully searchable by any of its primary fields consisting of asset number, location, status and alarm type. The form must also provide filters to facilitate selecting the type of conditions including all alarms and failures that are displayed.

2.4.6 Help System

2.4.6.1 The software must include a help file that provides an overview of system features, descriptions of system software screens, and instructions on how to use the system to perform tasks.

2.4.6.2 The help system must be context sensitive. If the help file is accessed by the user from while a particular software dialog, window, or setting is in focus, the help topic on that dialog, window, function, or feature will display.

2.4.6.3 Help file must be editable by Authorized Client User to allow for updating and customization.

2.4.6.4 The on-line help system section must be kept up to date with all features and functions and must be context sensitive with the current version installed.

2.5 Access, Security, and Administration

2.5.1 User Groups and Access

2.5.1.1 The software must not limit the number of user accounts.

2.5.1.2 The software must not limit the number of client installations or concurrent connected clients. The software performance must not degrade when the number of concurrent clients is connected and when the number of concurrent clients increases.

2.5.1.3 The software must support the configuration and use of multiple security level groups for administrators and users.

2.5.1.4 The software must support the use of Microsoft Active Directory for account access and user management.

2.5.1.5 The software must allow administrators to create user definitions that include assignment of geographical or other defined regions/corridors to user accounts.

2.5.1.6 The software must allow user accounts per jurisdictions to be granted read-only and read-write permissions for access to system features and functions, including system settings, controller settings, upload/download, scheduling, and reporting.

2.5.1.7 The vendor must complete the ITD Enterprise Security Matrix (see Appendix A). This document will be sent to IT Security for review via a remedy ticket.

2.5.2 Adding and Removing Devices

2.5.2.1 The software must provide the user the ability to add and remove devices from the main map.

2.5.2.2 Adding devices can be performed by selecting an existing device to copy it and then pasting the new device to its location.

2.5.2.3 The software must allow authorized users to remove devices by selecting an existing device and pressing “Delete”.

2.5.3 Device Groups and Lists

2.5.3.1 The software must allow users to assign field devices, such as controllers, to groups. The software must allow users to administer and manage multiple field devices by group.

3. Intersection Control Functions

3.1 Time of Day Operations

3.1.1 The software must provide the ability to use Time of day (TOD) and Day of Week (DOW) scheduling and commands as specified in the Controller Software specification.

3.2 Traffic Responsive Operations

3.2.1 The system must support traffic responsive operations.

3.2.2 Software must utilize the USDOT traffic-responsive algorithm.

3.2.3 Users must be able to define volume and occupancy thresholds to suit the coordination plan.

3.3 Adaptive Traffic Control Operations

3.3.1 The software must support Adaptive Traffic Control features and functions.

3.3.2 The system must retain a historical record of system timing changes and adjustments resulting from adaptive traffic control features and functions.

3.3.3 The system must allow the configuration of multiple zones that can include multiple intersections for zone-based adaptive control configuration, activation, and operation.

3.3.4 The system must allow scheduling of adaptive control operation.

3.3.5 The system must revert to normal or local time-of-day operation if adaptive operation terminates due to communication failure.

3.3.6 Adaptive Control must allow alternate phase sequence based on traffic demand.

3.3.7 Adaptive Control must allow phase re-service based on traffic demand.

3.3.8 Adaptive Control must support transit signal priority functions and preemption.

3.4 Manual Commands

3.4.1 The software should be able to use a manual command to run any user-defined and system-defined reports.

3.4.2 The software must allow manual command to override any scheduled event.

3.5 Priority and Preemption

3.5.1 The software must support user selected route-based pre-emption using data received from third-party fire-rescue dispatch systems.

4. Databases

4.1 Central software database

4.1.1 The central software system must utilize Microsoft SQL Server 2019 or newer.

4.1.2 The software must create and periodically update a backup database that can be used for system restoration and controller setting restoration. The full and partial backup frequency must be configurable system wide or individual locations.

4.2 Controller database management

4.2.1 The software must allow the user to perform complete and partial uploads and downloads of each controller's database.

4.2.2 The system must provide users the ability to perform database comparisons between controllers and previous back-ups.

4.2.3 The system must allow users to compare a database uploaded from a field controller to the database on file for that controller in the central software.

4.2.4 The system must be able to automatically compare central and field controller databases for mismatch on a daily basis and generate a daily report.

4.2.5 The software must provide for a user-defined clock synchronization scheduled command. Clock synchronization must include options to sync with an NTP, the central software or other uniform server to ensure all devices are coordinated to the same time.

5. EVENT LOGS AND REPORTS

5.1 Event Logs

5.1.1 The software must log all data entry and changes made in the system. The log must include the user ID, the date and time of the entry or change, the original data, and the new/modified data entered by the user.

5.1.2 The software must log all uploads and downloads involving configuration changes.

5.1.3 The system must have user activity and event log capabilities. Retention and archiving requirements will be defined by MDC.

5.1.4 The system must monitor and log field device status and health including, but not limited to, logging changes in field device operation (e.g., free, coordinated, etc.), detection malfunctions, and cabinet access.

5.2 Reports

5.2.1 The software must provide system and operational reports with filters for data selection. The software must provide reports including communication status reports, coordination status reports, configuration summary reports, user activity reports, intersection timing reports, detector data reports, event reports, preemption reports, error reports, and performance measure reports. The users must be able to export any data from database to Microsoft Excel, or any other editable formats, such as CSV. The reports must also be able to export in .pdf format and and published to a signal status dashboard.

5.2.2 The software must allow Administrator to have the ability to schedule and deliver report to group of individuals, Administrator or authorized user must have the flexibility to generate reports on demand ad-hoc or scheduled to run automatically at predefined intervals.

5.2.3 The software must allow users to create and save customized reports and report templates.

5.2.4 Report templates must allow users to run reports with preset parameters quickly.

5.2.5 The software must allow users to setup reports to run automatically.

5.2.6 Communication Status

5.2.6.1 Communication status must include historic repetitive failure rate information.

5.2.6.2 Communication status must include device communications configuration.

5.2.7 Coordination Status

5.2.7.1 The software must provide information for scheduled coordination patterns and log all transitioning and free operations due to coordination errors.

5.2.8 Configuration Summary Reports

5.2.8.1 The software must include user defined customizable reports that detail configuration summary of all devices monitored by the system.

5.2.9 User Activity Reports

5.2.9.1 The software must log all user activities including, but not limited to, user ID, date, time, activity and user specific information on a custom report.

5.2.10 Intersection Timing Reports

Reports must include scheduled timing plans, real time phase logs, manual command override, and changes to schedule plans as minimum.

5.2.11 Data Reports

5.2.11.1 Detector Data Reports configurable by TOD, including but not limited to occupancy, volume and detector calls data.

5.2.12 Event Reports

5.2.12.1 Reports must include schedule events, manual command override, and changes in scheduled events as minimum.

5.2.13 Preemption Reports

5.2.13.1 Reports must include type of pre-emption, pre-empted phase and number of instances as minimum.

5.2.14 Error Reports

5.2.14.1 The software must provide error reporting capabilities for devices, detection, communications, system, and network as minimum.

5.2.15 Performance Measure Reports

5.2.15.1 The software must provide MOE reports including information such as percentage green used, cycle length, and plan summaries. Performance measure reports must support the use of controller high resolution data logging enumerations as a data source.

APPENDIX A

INFORMATION TECHNOLOGY SECURITY MATRIX

VERSION 102023

H.R. 5515

In accordance with US House of Representatives H.R. 5515 "National Defense Authorization Act for Fiscal Year 2019" House Bill, the Solution shall not utilize products or services from the manufacturers listed therein.

Use of Miami-Dade County Data and Systems:

1. **Access Control:** Miami-Dade County (MDC) employees, system users, contractors or those operating on their behalf are prohibited from incorporating or using AI-enabled services in such a way that Miami-Dade County data is uploaded or made available for data mining or usage. Uploading, copying, sharing, or transmitting any sensitive Miami-Dade created or managed data via methods or software not explicitly allowed are prohibited. This includes any PCI, PII, HIPAA, CJIS or other data that is created or managed by or on behalf of Miami-Dade County. Access controls are to be guided by the Miami-Dade County Enterprise Security Policy. The MDC Enterprise Security Policy is available to responsive bidders or upon request approved by the MDC Enterprise Security Office.

2. **Data Protection:** All data processed by Cloud-based or AI-enabled technologies must be protected from unauthorized access, theft, and misuse. Data must be encrypted in transit and at rest, and access controls should be in place to ensure that only authorized users can access the data. Data should be stored securely, and backups must be kept in a secure location. Usage of said data by the Cloud or AI provider must be communicated and agreed to, with consideration to transparency and with human oversight of use and potential abuse or misuse.

3. **Monitoring:** Any Cloud-based or AI-enabled technologies must be monitored for unusual activity or unauthorized access. Logs and alerts should be reviewed regularly, and security analytics should be used to identify potential threats or hallucinations.

4. **Vulnerability Management:** Any Cloud-based or AI-enabled technologies must be regularly assessed for vulnerabilities and weaknesses. Regular vulnerability scans and penetration testing must be conducted, and security assessments must be performed to identify areas of improvement.

5. **Incident Response:** Abuse or misuse to the extent that it engenders the security or privacy of Miami-Dade County citizens, users, data, personnel, or facilities must be reported according to the Miami-Dade County Enterprise Security Office Incident Response Plan.

6. **Training and Awareness:** All employees must receive training on the secure use of any Cloud-based or AIenabled technologies. This should include best practices for data protection, access controls, and incident response.

7. **Compliance:** Any Cloud-based or AI-enabled technologies must be compliant with relevant laws and regulations, such as GDPR, HIPAA, and CCPA as well as compliant with Miami-Dade County Security Policy and the overall policies and procedures of Miami-Dade County. Regular audits should be conducted to ensure compliance.

8. **Risk Management:** A risk management program should be in place to identify and mitigate risks associated with the use of any Cloud-based or AI-enabled technologies. Risks should be regularly assessed, and appropriate controls should be put in place to mitigate those risks.

9. **Coordinated Vulnerability Disclosure:** Miami-Dade County follows a vulnerability disclosure model in which a vulnerability or an issue is disclosed to the public only after the responsible parties have been allowed sufficient time to patch or remedy the vulnerability or issue.

The Proposer is requested to enter a code in the space provided that best corresponds to the intended response for the requests listed. Comments that further clarify how the functionality is addressed should be included in the Response Comments column.
The acceptable codes are as follows:

"Y" – Will be FULLY met (without configuration or modification).
"C" – Will be met via configuration (without changing base source code).
"M" – Will be met via modification of the base source code.
"N" – Will not be met. If an alternative compensating control is being proposed, please provide a detailed explanation. A blank or N/A in any box will be interpreted as an "N".

Functionality		Meet (Y/C/M/N)	Module / Detailed Explanation
1	Type of Data Processed (PII, PCI, PHI, HR, CJIS, HIPAA, Financial, etc.): Remove any that do not apply:		○ PII (Personally Identifiable Information) ○ PCI (Payment Card Industry) ○ PHI (Personal Health Records) ○ HR (Human Resources) ○ CJIS (Criminal Justice Information Systems) ○ HIPAA (Health Insurance Portability and Accountability Act) ○ Financial Records ○ Other:
2	Has the system had a SOC-2 or other risk assessment been performed within the last 12 months.		
3	Solution uniquely identifies each user.		
4	Solution provides integration with Microsoft Active Directory or Azure Active Directory for user authentication of Internal users. (ADFS, FIM, MIM)		

5	Solution can be installed and maintained in accordance to the Microsoft Enterprise Access Model. https://docs.microsoft.com/en-us/windowsserver/identity/securing-privileged-access/securing-privileged-accessreference-material		
6	Solution can be installed and maintained in accordance to the principle of least privilege for Operating systems.		
7	Solution can be installed and maintained in accordance to the principle of least privilege for Database systems.		
8	Solution uniquely identifies each process (system, service, Managed Service Accounts) account.		
9	Solution supports scheduled password rotation of process (system, service, Managed Service Accounts) accounts.		

10	Default System accounts are either disabled or capable of being renamed. (e.g. administrator/admin, guest)		
11	Accounts are automatically disabled after a configurable period of inactivity (e.g. 90 days).		
12	Solution utilizes account passwords for authentication.		
13	Account Password complexity is configurable to allow for a minimum of 14 characters comprised of upper and lower alpha, numeric and special characters (e.g. !, @, #, $, %, &, *)		
14	Passwords are suppressed (not echoed back) when entered by users.		
15	Solution supports Multi-Factor Authentication (MFA)		
16	User login credentials (user account/password) are encrypted in transmission with a minimum of AES		

	256 bit encryption		
17	Solution supports password history functionality whereby password re-use is prohibited for a configurable number of prior passwords of at least 10.		
18	Solution supports administrative passwords aging of 30 days.		
19	Administrative accounts have the capability of resetting passwords		
20	Solution provides user self-service password reset functionality utilizing a challenge and response authentication		
21	Solution includes self-service challenge and response that are comprised of 8 challenge questions and stores user's responses during registration. Responses must be stored with a minimum of AES 256 bit encryption.		
22	Solution includes self-service password reset that presents user with a configurable number of random challenge questions which when answered correctly will enable the password to be reset.		
23	Solution supports the ability to limit unsuccessful login attempts to 5. If the number of unsuccessful login attempts is exceeded, system locks out or disables user account.		
24	Solution supports limiting concurrent user sessions to 1 by default, and the number of concurrent user sessions is configurable by administrators.		
25	Solution provides administrative capability to lock or disable accounts whenever necessary.		
26	Solution supports the display of a configurable warning, pre-login banner during solution login indicating that unauthorized access is prohibited.		

27	Solution supports the ability to manage users based on group membership. (role based privileges) in addition to assigning/revoking specific user based privileges		
28	Solution provides tools and reporting to enumerate user rights/privileges, group membership, access to locations/functions or user profiles		
29	Solution provides audit logging capability which captures successful logins, unsuccessful logins, records viewed, printed, added, deleted or modified and has the capability to retain logs for a period of 5 years plus current.		
30	Solution audit logs captures date and time, user account, source IP address, audit event and success or failure of event		
31	Solution prohibits administrators from disabling the audit mechanism.		
32	Solution ensures the audit log is protected from unauthorized access. (i.e. logs are capable of simultaneously being sent to a logging server or SIEM in addition to being maintained locally)		
33	Solution prevents users or administrators from editing the audit log. (modifying, deleting or adding log entries)		
34	Solution provides for software version controls to prevent outdated versions of software access to DBMS.		
35	Solution generates outbound alerts and notifications. Explain what data is contained in said messages (e.g. email alerts, automated reports, SMNP traps).		
36	If Solution's database is relational, referential integrity is enforced by the		

	RDBMS		
37	Solution prohibits users, developers, DBA's or system administrators from making changes to posted, completed or closed transaction records.		
38	Solution provides rollback processes incorporated into the database for all critical transactions		
39	Solution ensures that sensitive data (data that falls under the scope of **FSS 539.003,** CJIS, PII, SOX, HIPAA, and PCI requirements) is encrypted during transmission over the client's network (minimum AES 256-bit encryption)		
40	Solution ensures that sensitive information (data that falls under the scope of **FSS 539.003**, CJIS, PII, SOX, HIPAA, and PCI) which is vulnerable to unauthorized access, encrypted while in storage (minimum AES 256-bit encryption)		
41	Solution ensures that Is sensitive information (data that falls under the scope of **FSS 539.003,** CJIS, PII, SOX, HIPAA and PCI) encrypted for transmission over external networks or connections. (minimum AES 256-bit encryption)		
42	If Cloud Hosted, Solution is hosted in an audited data center complying with ISO 27001, SAS 70, SSAE 16 or SOC2 or3 audit standards. (please provide copy of most recent audit)		
43	If Cloud Hosted, Solutions has controls in place which prohibit Hosting or Solution's employees or 3rd party vendor technical support personnel access to or the ability to access, view or modify customer confidential data in compliance with **FSS 536.003**. Please describe controls used to ensure data		

	confidentiality, including encryption and key storage mechanisms.		
44	If Cloud Hosted, Solution is a high availability solution with either active-active or active-passive failover between geographically diverse data centers		
45	If Cloud Hosted, System and data is physically located within the Continental United States.		
46	If Cloud Hosted, System is accessible from the County network and Proxy infrastructure		
47	If Cloud Hosted, System encrypts all sessions from initiation to termination using validated encryption ciphers (TLS 1.2 or higher)		
48	If Cloud Hosted, Solution is scanned for vulnerabilities on a regular basis (monthly) using commercially available vulnerability scanners such as Nessus, Qualys etc. Monthly vulnerability reports must be shared with the County.		
49	Solution must be regularly patched with appropriate OS/database/application security patches within 30 days of vendor release.		
50	Solution must have “Critical” security patches applied within 7 (seven) calendar days of release from vendor.		
51	Solution must be maintained on current supported release of OS/database/applications. End of Life (EOL) versions will be upgraded prior to end of vendor support date.		

52	Solution must be scanned for Application vulnerabilities on a regular basis (monthly) using commercially available vulnerability scanners such as WebInspect, Veracode, or AppScan, or comparable.		
53	If Cloud Hosted, Solution or solution will have change control processes implemented to provide application vulnerability scanning (PCI, OWASP top 20) prior to production migration of any		
	changes. All “Medium, Critical, and Severe” vulnerabilities will be remediated prior to migration. Application vulnerability reports will be shared with the County.		
54	Any API must use API key security (X-API-Key) or demonstrate alternate security controls.		
55	If Cloud Hosted, Solution is protected using Intrusion Detection and Prevention technology (IDS/IPS)		
56	If Cloud Hosted, Solution is protected against Distributed Denial of Service (DDOS) Attack		

Exhibit 9
System Requirements Matrix - Table 1

Instructions to Vendors:
1. Columns A-B are for information only. Vendor shall complete the fields at the top-right corner and Columns C-G.
2. For each function noted, Vendor shall mark one of the following on Column D: OB - Meets requirement "out of the box"
CNF - Meets requirements with special configuration CST - Meets requirements with custom software code NAV - Not available
3. Please enter Comments in Column G to explain the reason for any functions that are noted as Not Avaliable.
Traffic Signal Local Controller Hardware - Functional and Perfomance Requirements Matrix

Manufacturer:	
Controller Model:	
Contact:	

A	B	C	D				G
No.	Function	NTCIP Object Code (If Compliant)	Compliance OB - Meets requirement "out of the box" CNF - Meets requirements with special configuration CST - Meets requirements with custom software code NAV - Not available				Comments (attach additional sheets as necessary)
			OB	CNF	CST	NAV	
1.3	**System Description**						
1.3.1	Controllers must provide functionality that meets or exceeds operational characteristics, including NTCIP support, as described in NEMA TS 2-2021.						
1.3.2	Controllers must capture all mandatory event-based data elements listed in the FDOT State Traffic Engineering and Operations Office supplemental requirements for controllers (SR- 671-2, Supplemental Traffic Controller High Resolution Data Logging Requirements). Controllers must provide all event-based data elements listed in the FDOT State Traffic Controller High Resolution Data Logging Requirements without any missing data.						
1.3.3	Controller software must meet or exceed the requirements of the Miami-Dade Traffic Signal Controller Local Software Specifications maintained by the Miami-Dade County Department of Transportation and Public Works (the Department).						
2.1	**Materials and Equipment**						
2.1.A	Controller must meet the latest Caltrans TEES requirements for a 2070LX Traffic Signal Controller unit and include, at minimum, the unit chassis, 2070-1C CPU, 2070-2E+ field I/O module, 2070-3B Front Panel, and 2070- 4A Power Supply.						
2.1.B	Controller must be approved and listed on the:						
2.1.B.1	Caltrans' QPL as a Model 2070LX Controller Unit,						
2.1.B.2	Florida Department of Transportation's APL, and						
2.1.B.3	Miami-Dade County Traffic Signals and Signs Division's TSSQPL.						
2.1.C	Ensure equipment is permanently marked with the manufacturer's name or trademark, part number, and serial number. Controller serial number must be readily visible without putting the intersection into a flash operation.						
2.2	**Extra Materials**						
2.2.A	A spare Data Key and a spare 2070-2E+ module must be provided for every ten traffic controllers supplied.						
2.2.B	A physical set of controller schematics and a repair manual must be provided for every one hundred (100) traffic controllers supplied.						
2.3	**Accessories**						
2.3.A	The controller must be provided with all accessories and incidental material necessary for installation and operation in a Miami-Dade traffic controller cabinet including, but not limited to, mounting hardware, power cable, data key, and interface card such that installation into the Miami-Dade cabinet does not require any additional components.						

MDC260

MIAMI-DADE COUNTY

Instructions to Vendors:

1. Columns A-B are for information only. Vendor shall complete the fields at the top-right corner and Columns C-G.
2. For each function noted, Vendor shall mark one of the following on Column D: OB - Meets requirement "out of the box"
CNF - Meets requirements with special configuration CST - Meets requirements with custom software code NAV - Not available
3. Please enter Comments in Column G to explain the reason for any functions that are noted as Not Avaliable.

Traffic Signal Local Controller Software - Functional and Perfomance Requirements Matrix

Manufacturer:	
Controller Software:	
Contact:	

A	B	C	D				G
No.	Function	NTCIP Object Code (If Compliant)	Compliance OB - Meets requirement "out of the box" CNF - Meets requirements with special configuration CST - Meets requirements with custom software code NAV - Not available				Comments (attach additional sheets as necessary)
			OB	CNF	CST	NAV	
1.2	**Controller Software Overview**						
1.2.1	The controller software must be a product from the traffic controller manufacturer designed to run on a Linux operating system and 2070LX hardware platform compliant with MDC traffic signal controller hardware specifications and Caltrans TEES 2020 requirements including all Errata for a 2070LX Traffic Signal Controller unit. In addition, the controller software shall be compatible with Advanced Transportation Controllers meeting the requirements of ATC 5201 Advanced Transportation Controller Standard v06A.						
1.3	**Software Attributes**						
1.3.2	The controller software must operate on the Miami-Dade County network and not interfere with other systems. The controller software must be compatible with all 170 type cabinets, including, but not limited to the existing Miami-Dade County MD-552 and MD-660 series controller cabinets, Caltrans model cabinets, and Advanced Transportation Controller cabinets (ATC 5301 v02.02).						
1.3.3	The controller software must fully support the controller requirements of Caltrans TEES 2020 2070LX, ATC 5201 Advanced Transportation Controller Standard v06 (v06A.37), and these Specifications.						
1.3.4	The controller software must provide functionality that meets or exceeds operational characteristics, including National Transportation Communications for ITS (Intelligent Transportation Systems) Protocol (NTCIP) support, as described in National Electrical Manufacturers Association (NEMA) TS-2-2021.						
1.3.5	The controller software must support all mandatory traffic signal controller requirements and objects defined in NTCIP 1202 as well as Appendix A, Miami-Dade Traffic Signal Controller NTCIP requirements.						
1.3.6	The controller software must not rely upon proprietary objects or protocols for communications or operational.						
1.3.7	Controller software must be provided with the entire MIB in electronic and hard copy. Controller software use must include rights to re-use/redistribute the entire MIB including any extensions as necessary to communicate to the Central Software.						
1.3.8	The controller software must be fully functional, compatible, and readily loadable onto all Model 2070LX controllers listed on the Miami-Dade County Traffic Signals and Signs Division Qualified Products List.						
1.4	**Reliability**						
1.4.1	The controller software must include features that help achieve high reliability, such as modularity, backup, and recovery. Storage and backup functions/alarms to be saved for a minimum of 30 days.						
1.5	**Support and maintenance**						
1.5.1	The controller software license must provide Miami-Dade County with proven and tested updates at no cost for as long as the controller hardware is supported by its manufacturer.						
1.5.2	Any update on the controller software must not inadvertently affect any software functions that are not the defined target of the update. Verification testing must include all controller functions.						

A	B	C	D				G
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			OB	CNF	CST	NAV	
2	**General and Administrative**						
2.1.1	The controller software must be able to display real-time intersection information including: date and time, phase, operating mode, preemption, detector status, alarms and coordination status.						
2.1.2	The controller software must allow the user to view software, I/O map, and operating system (linux) version information						
2.2.1	The controller software must permit authorized users to update the operating system and traffic signal application via USB and laptop computer.						
2.2.2	The controller software must permit authorized users to update the operating system and traffic signal application via remote operations. Updates using remote operations must not cause the signal to go into flash.						
2.3.1	The controller software must allow programming locally via the display panel, locally via USB, locally via Data Key, locally via a laptop PC by a serial or Ethernet cable, and remotely from a Central ATMS software via NTCIP commands.						
2.3.2	The controller software must allow administrators to set multiple user IDs with unique passcodes.						
2.3.3	The controller software must provide a minimum of 3 security levels (e.g., Administrator, read-write for configuration settings except user IDs and passcodes, and read-only).						
2.3.4	The controller software must reside in non-volatile flash memory.						
2.3.5	The controller software must check file compatibility and integrity of updates prior to implementation.						
2.3.6	The controller software must advance security features as per the Caltrans TEES 2020 specification.						
2.4.1	The controller software must support central software user ability to copy data from one phase, timing plan, detector plan, detector options, pattern, or sequence or any other programmable value to another like feature to facilitate programming where values are the same.						
2.4.2	The controller software must provide the ability to create and store a backup database that can be used to restore a controller or program a new controller.						
2.5.1	The controller software must prompt the user to confirm changes prior to committing them to the controller database for implementation.						
2.5.2	The controller software must highlight changes to settings prior to committing them to the controller database for implementation.						
2.5.3	The controller software must prompt the user prior to activating changes.						
2.5.4	The controller software must have capability to upload and download controller database via USB and data key.						
2.5.5	The controller software must have capability to to upload and download controller database via remotely.						
2.5.6	The controller software must have the ability to perform automatic periodic database backups.						
2.5.7	The controller software must log all changes performed by the users.						
2.5.8	The data key must be capable of automatically updating itself every one (1) hour. If the controller needs an additional key for the Adaptive system, it needs to be different and distinguished from the controller key..						
3	**Signal Control**						
3.1.1	Display menu must provide access to control all programmable features. All display menu access must follow the security and programming section, which requires user secure credentials to access and make any edits from the display menu.						
3.1.2	The controller software must include a help system that provides information regarding the currently active menu or selected parameter.						
3.2.1	The controller software must support programming up to sixteen phases for vehicles.						
3.2.2	The controller software must support programming up to sixteen phases for pedestrians.						
3.2.3	The controller software must support up to sixteen configurable phase sequences.						
3.2.4	The controller software must support up to four rings.						
3.2.5	The controller software must be able to turn on and turn off exclusive pedestrian phases by TOD/DOW/Temporary time base schedule commands which will time and display pedestrian indications with vehicle movements remaining in all red. The temporary time base requires development.						
3.2.6	The controller software must be able to replicate the operation of existing functions, including special functions the programming of such functions must be equal or better of the existing system, including the reliability, maintainability, portability, supportability, and usability equal to or better than the existing system.						
3.2.7	The controller software must allow the pedestrian phases (Walk, Flash Don't Walk) to be fully served during normal operation and during transition between phase banks.						
3.3	**Input & Output Assignments**						
3.3.1	I/O mapping and pin assignment must meet standard C1 connector and terminal specifications from Miami Dade cabinet configuration as noted below..						

3.3.1.1	Pin 49 - Spare is Reserved						
3.3.1.2	Pin 50 - Spare is Reserved						
3.3.1.3	Pin 53 - Spare is Reserved						
3.3.1.4	Pin 54 - Spare is Reserved						
3.3.1.5	Pin 66 - Pretime is Reserved						
3.3.1.6	Pin 68 - Spare Input is Reserved						
3.3.1.7	Pin 91 - Spare						
3.3.2	Only one (1) I/O map and pin assignment to be used and deployed for all the controllers in Miami-Dade County. The use of multiple I/O map software is not allowed on this project.						
3.3.3	The controller software must allow authorized users to modify/assign all inputs and outputs.						
3.3.4	The controller software must support flashing yellow arrow operation.						
3.3.5	The controller must support Pedestrian Hybrid Beacon operation.						
3.4.1	The controller software must support logic commands including AND, OR, NOR and NAND, and latching operations.						
3.4.2	Logic gates must support delay and extension timing for all inputs and outputs.						
3.5	**Startup Operations**						

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3.5.1	The controller software startup conditions are configurable to include a user defined all-red or flash interval.						
3.5.2	The controller software must permit users to assign startup phases, flash duration, all red duration, side street green, main street green, and vehicle and pedestrian calls on startup.						
3.6	**Phase Timing Parameters**						
3.6.1	The controller software must permit unique timing parameters and allow users to define minimum and maximum green time and secondary maximum green time, yellow clearance time, and red clearance time for any phase.						
3.6.2	The controller software must allow users to define secondary maximum green time for any phase.						
3.6.3	The signal controller software must permit users to define the amount of time necessary between detector actuations to cause a gap out for any phase.						
3.6.4	The signal controller software must permit users to define the duration of Flashing Don't Walk time for any phase and must allow the users to include the clearance time if pedestrian operation is negative to overlaps.						
3.6.5	The controller software must support rest in walk, advance and delay pedestrian walk, flashing don't walk time and green time.						
3.6.6	The controller software must support gap reduction and dynamic max limit defined by user						
3.6.7	The controller software must support conditional service and phase conditional re-service for any phase.						
3.6.8	The controller software must be capable of providing a Leading Pedestrian Interval						
3.6.9	The controller software must be capable of providing minimum green time for overlaps.						
3.7.1	The controller software must support phase omit per TOD/DOW.						
3.7.2	The controller software must support minimum and maximum recall for any active phase per TOD/DOW.						
3.7.3	The controller software must prevent a yellow trap via detector switching or similar option.						
3.8.1	The controller software must support programming up to sixteen overlaps for vehicles.						
3.8.2	The controller software must support programming up to sixteen overlaps for pedestrians.						
3.8.3	The controller software must support programming up to sixteen overlaps for pedestrians. The controller software must support negative (or minus) pedestrian overlap which allows the controller to serve a pedestrian phase without starting the conflicting overlap until the programmed pedestrian phase has completed to solid don't walk. If the overlap is already on when a pedestrian phase should be serviced, the pedestrian phase will be delayed until the conflicting overlap is terminated						
3.8.4	The controller software must be able to time green, yellow, and all red times.						
3.8.5	The signal controller software must permit users to define compatible and incompatible phases with overlaps.						
3.8.6	The controller software must maintain uninterrupted operation of standard overlaps during normal operation and coordination. The controller software must prevent premature termination of overlaps that have negative pedestrian modifiers and ensure the minimum green time requirements are fulfilled.						
3.8.7	The controller must support programming of guaranteed minimums for overlaps (Green, Walk, Ped, yellow, and red).						
3.9	**Detectors**						
3.9.1	The controller software must support a minimum of 64 vehicle detectors and 16 pedestrian detectors.						
3.9.2	The signal controller software must provide a minimum of 3 unique sets of detectors parameters.						
3.9.3	The signal controller software must allow users to assign attributes to each vehicle and pedestrian detectors and use it as counting detectors.						
3.9.4	The controller must support detector set switching by TOD for special functions.						
3.10	**Coordination**						
3.10.1	Coordination functions to control intersection cycle lengths, system offset relationships, and phase split percentages are provided as a standard feature, with no need for additional modules or software.						
3.10.2	Coordination, Time of Day, and external alternate sequence can alter the standard phase by selecting a configurable sequence.						
3.10.3	Offset correction/transition mode and maximum number of cycles defined by user.						
3.10.4	The controller software provides configurable minimum values for green, walk, pedestrian clearance, yellow clearance, red clearance and overlap. These values cannot be changed by the controller.						
3.11	**Date and Time Functions**						

3.11.1	The controller software must include a clock that keeps track of the current date and time. Ensure the clock can be configured to a local time based on the time zone offset and be remotely set.The controller software must be able to be synchronize with the central server time. Additionally, the controller software must support automatic synchronization throughout the day (e.g., minimum of every 4 hour intervals or lesser).						

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			OB	CNF	CST	NAV	
3.11.2	Controller software must support scheduling based on time of day and external triggering. The scheduler must permit the user to define the months, days of week, and date of month for assigned day plans.						
3.11.3	The scheduler must permit users to define and use time-of-day for functions including, but not limited to timings, coordination patterns, detector plans, automatic flash, and special functions.						
3.11.4	The controller software must be able to adjust daylight saving time automatically including leap year added extra day.						
3.12	**Preemption and Priority**						
3.12.1	The controller software must provide control to enable or disable preemption by plan or phase. The controller software must include a user configurable duration and sequence that the preemption signal is active prior to initiating the signal preemption. Preemption duration must be configurable.						
3.12.1.1	The controller software must permit the user to define an all red state prior to entering preemption.						
3.12.1.2	The controller software must allow the user to define preemption exit settings, including phases for exiting preemption and the recovery period.						
3.12.1.3	The preemption priority must allow "nested" preemption.						
3.12.2.1	The controller software must support a minimum of eight preemption sequences without requiring additional software or hardware.						
3.12.3.1	The controller software must support a minimum of ten bus or other low-priority preemption sequences without requiring additional software or hardware.						
3.12.3.2	The controller software must provide a minimum of 4 set of TSP strategy parameters and 16 TSP strategies.						
3.12.3.3	The controller software must be compatible with all South Dade Busway intersections.						
3.13	**Controller Event Logs**						
3.13.1	The controller software must include an event log buffer capable of storing a minimum of 30 days of time and date-stamped high resolution events or alarms. Once logged, events remain in the buffer until cleared or the lo buffer capacity is exceeded. When capacity is reached, events are over-written by the first-in first-out method.						
3.13.2	The controller software must permit users to collect events and alarm data remotely and export data to USB in a readable format.						
3.13.3	The controller software must include logs of local access to controller consisting of at a minimum but not limited to personnel that accessed, date, time and changes made. The controller software must transmit these events to the central or saved for at least six (6) months.						
3.14	**Communication**						
3.14.1	The controller software must support communication via Ethernet and Serial interfaces. Ethernet interfaces must be able to provide ICMP Echo Replies to ICMP Echo Requests.						
3.14.2	The controller software must allow the network ports to be configurable to the MDC needs.						
3.15	**Front Panel Interface**						
3.15.1	The controller software must provide a menu-based front panel user interface using the controller front panel display and keypad controls.						
3.15.2	The front panel interface must permit authorized users to read, enter, modify, and save edit all programmable controller settings.						
3.15.3	The controller software must provide different users security levels thought front panel						
3.15.4	The front panel must return to a user-definable state after a user-specified amount of time with no front panel activity.						
3.15.5	The controller software must permit authorized users to update the database via laptop computer or thought th communications system. The controller software must log all changes for at a minimum of six (6) months. The changes recorded must at a minimum include but not limited to user ID, date, time, and changes made.						
4	**Peer-to-Peer Operation**						
4.1.1.1	The controller software must provide Peer-to-Peer operation that allows controllers to share information over an Ethernet network between intersections. The controller software must allow programming of peer-to-peer functions, including the identification of peer controllers by IP address.						
4.1.1.2	The provided data must include phases, plan, flash, TSP and signal status, detectors, logic gates, preemption, and input/output pins.						
5	**Central System Compatibility**						
5.1.1	The controller software must be compatible with Miami-Dade Central Traffic Management System Software.						
5.1.2	The controller software must support adaptive traffic control and connected vehicle applications.						
5.2.1	The controller software must be NTCIP compliant in accordance with these specifications.						

MIAMI-DADE COUNTY

Manufacturer:

Instructions to Vendors: **Contact: Central Traffic Signal Control System Software:**

1. Columns A-B are for information only. Vendor shall complete the fields at the top-right corner and Columns C-G.
2. For each function noted, Vendor shall mark one of the following on Column D: OB - Meets requirement "out of the box"
CNF - Meets requirements with special configuration CST - Meets requirements with custom software code NAV - Not available
3. Please enter Comments in Column G to explain the reason for any functions that are noted as Not Avaliable.

Central Traffic Signal Control System - Functional and Perfomance Requirements Matrix

A	B	C	D				G
No.	Function	NTCIP Object Code (If Compliant)	Compliance OB - Meets requirement "out of the box" CNF - Meets requirements with special configuration CST - Meets requirements with custom software code NAV - Not available				Comments (attach additional sheets as necessary)
			OB	CNF	CST	NAV	
1.2	**System Overview**						
1.2.1	The central traffic management system software must support transportation system management and operations of 3,200 intersections, including active arterial management, and be scalable to accommodate future growth of intersections and other devices.						
1.2.2	The software must be a scalable Windows-based COTS Advanced Traffic Management System (ATMS) client server software package from a traffic controller manufacturer. The minimum system hardware and software configuration provided must support monitoring and management at a minimum of 4000 controllers as well as concurrent system operation and user access from a minimum of 50 clients at the same time without performance degradation. The software must be capable to accommodate future growth over the next two decades. The system must be able to handle increased volumes of traffic data, traffic controllers, and users as the network grows.						
1.2.3	Server software must be designed to run on the Windows Server operating system (Windows Server 2019 and newer). Client workstation software must be designed to run on Microsoft Windows 10 Professional and newer. Databases must utilize Microsoft SQL 2019 and newer.						
1.2.4.1.1	The software must operate on the Miami-Dade County network and not interfere with other controller software systems or other systems.						
1.2.4.2.1	The software design must include features that help achieve high availability, such as load balancing, modularity, redundancy, backup and recovery, ability to run in a virtual server environment, and failure detection. Frequent weekly server or service restarts should not be required.						
1.2.4.2.2	The system must automatically log application failures and notify users via email.						
1.2.4.2.3	The system must have a disaster recovery plan in the event of a catastrophic event.						
1.2.4.3.1	The software license must provide Miami-Dade County with central system software updates for the major release supplied at no cost for as long as the release is supported by the vendor.						
1.2.4.3.2	The system must allow automatic update of workstation client software without any user interference or configuration to the current version when a user login occurs from that workstation.						
1.2.4.3.3	The system must allow automatic update of workstation client software including the un-installation of any previous version of the software automatically/silently without user interaction.						
1.2.4.4	The system shall not limit the number of user accounts that can be defined.						
2	**Display and System Functions**						
2.1.1	The software must provide integrated intersection control and traffic management functions.						
2.1.2	The software must support integrated corridor management strategies in response to changing traffic conditions.						
2.2	**Interfaces**						

MDC267

2.2.1.1	The software must operate properly using the Miami-Dade County wide area network (WAN) for center to field communications. The software must provide full functionality using County WAN Ethernet connectivity that includes, but is not limited to, fiber optic interconnect and cellular communications.						

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			OB	CNF	CST	NAV	
2.2.1.2.1	The software must provide fully integrate with County-approved Caltrans Model 2070LX traffic signal controllers using the National Transportation Communication for ITS Protocol (NTCIP). The software must also support operation with NEMA TS2 controllers and ATC controllers listed on the Florida Department of Transportation Approved Product List (APL).						
2.2.1.3.1	The software must support use of NTCIP for all communication with field controllers and must support all mandatory NTCIP objects defined in NTCIP 1101 and NTCIP 1201 and all mandatory and optional traffic signal controller requirements defined in NTCIP 1202. The system must comply with NTCIP standards for communication over TCP/IP.						
2.2.1.3.2	The software MIBs and communication protocols must be non-proprietary.						
2.2.2.1.1	The software MIBs and communication protocols used for center-to-center (C2C) communication must be non-proprietary.						
2.2.2.1.2	The software vendor must provide technical documentation describing APIs, protocols, and software interfaces available for third-party data exchange and software development.This requirement must be at the County's discretion and or approval which 3rd party data is exchanged and used for software development.						
2.2.2.1.3	The software must support use of NTCIP for center-to-center (C2C) communication.						
2.2	**System Features and Functions**						
2.2.2.2.1	The software must include a documented application programming interface (API) that allows data sharing and exchange with other systems and applications, such as external public traveler information systems. This requirement must be at the County's discretion and or approval which 3rd party data is exchanged and used for software development.						
2.3.1.1	The software must be capable of displaying all controller configuration values.						
2.3.1.2	The software must allow users to open, review, modify, save, and edit all controller settings except I/O mapping.						
2.3.1.3	The software must allow controller settings to be copied and pasted from one controller to another.						
2.3.1.4	The software must provide configuration options to allow the user to add a new intersection using an existing intersection configuration as a starting point.						
2.3.1.5	The software must include default patterns to use as a basis for developing plans using new cycle lengths, splits, and offsets.						
2.3.1.6	The software must provide a warning to the user if a setting violates a rule or conflicts with other settings, e.g. cycle length is not equal to the total of the splits						
2.3.1.7	The software must accommodate exclusive pedestrian phases without compromising overlaps or other phases						
2.3.1.8	The software must allow complete and partial uploads and downloads from controller upon confirmation from the user to a system request						
2.3.1.9	The software must allow the user to upload, open, edit, store, and download all controller configuration parameters, including but not limited to: timing, overlaps, detectors, coordination parameters and settings, plans, controller configuration settings, clock settings, time of day settings, holiday settings, special event settings, and preemption settings.						
2.3.1.10	Configuration changes associated with common operations, such as adding controllers or changing controller types, must not require a restart of ATMS central software components						
2.3.1.11	The software must retain a history of previous controller settings, including timings and the user who implemented it. The software must include a user configurable storage limit for controller history settings and other logs. Once limits are reached, logs are overwritten in a first-in first-out manner						
2.3.1.12	The software must allow creation of multiple draft copies of signal timings on any particular intersection in order to prepare for modifications, such as hardware and signal operating plan improvements, in advance of deployment and implementation to the intersection. The software must allow draft signal timings to be developed, evaluated, reviewed, and approved for an associated signal controller without impacting the current timings in service on that controller/intersection. Direct download of new signal timings and configuration changes shall not be allowed without a pop-up warning and operator verification step, including the ability to compare current settings to pending changes.						
2.3.1.13	The software must support intersections with and without flashing yellow arrow (FYA) operation, diamond interchange operation, and bus priority functions.						

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			OB	CNF	CST	NAV	
2.3.2.1	The software must support all actuated control functions and operations described in the Manual on Uniform Traffic Control Devices (MUTCD) and NEMA TS2						
2.3.2.3	The software must provide manual command input which overrides normal signal operation.						
2.3.2.3	The software must provide split monitor functionality including analysis of splits for a minimum of 14 calendar days.						
2.3.2.4	The software must store a local copy of each controller's configuration settings						
2.3.2.5	The software must allow authorized users to upload, modify, and download all controller configuration settings individually and in groups						
2.3.2.6	The software must include the ability to copy data from one phase, timing plan, detector plan, detector options, pattern, or sequence to another like feature to facilitate programming where values are the same						
2.3.2.7	The software must include functions for grouping signals for coordination and/or other purposes						
2.3.2.8	The software must provide ability for outside parties to work within system for timing development in an off-system work area to determine the effect the timing plan and coordination plans would have on the corridor.						
2.3.3.1	The software must allow calendar scheduling of different functions and plans based on days of the year, time of day, day of week, special, and seasonal occurrence.						
2.3.3.2	The software must allow operators to configure single and recurring events for each device managed by the system.						
2.3.3.3	The software must notify operators of current events in effect and allow to save recurring events to be recalled and modified again.						
2.3.4.1	The software must provide alerts with configurable alarm levels depending on user/group assignment's and severity. Alerts must be able to automatically notify the appropriate personnel via email, text, or a combination of both when triggered. At minimum, the alert shall have asset #, location timestamp UTC, time elapsed, issues and saved to a centralized database for post evaluation and/or troubleshooting.						
2.3.4.2	The software must be able to display an on-screen alert indicator, window, or pop-up alarm to notify operators of events when the user account has been configured to receive them.						
2.3.4.3	The software must be able to provide notifications that alert operators to field controller events, including, but not limited to the following: cabinet door open, conflict flash, and preemption.						
2.3.4.4	The software must provide at least 3 user configurable priority levels for alerts (e.g., low, medium, high).						
2.3.4.5	The software must be able to require that users acknowledge high priority alarms. The software must log alarms and acknowledgements, including alarm information and user ID, date, and time of acknowledgement.						
2.3.4.6	The software must allow unacknowledged alarms to be re-sent and escalated to other recipients based on configurable settings.						
2.3.5.1	The software must provide configurable workflow support, including the ability to submit system changes to the appropriate supervisor for approval before implementation						
2.3.5.2	Software workflows must route approval request notifications via E-mail, log the approval of system changes, and be able to prevent the download and implementation of proposed configuration changes that are not authorized and approved						
2.3.6.1	The software must include asset information and search capabilities						
2.3.7.1	The software must include features that allow unicast and multicast video streams monitoring of all intersection on the system.						
2.3.7.2	The software must include a closed circuit television (CCTV) subsystem that allows users to monitor and contr IP-based digital video detection cameras utilizing NTCIP and ONVIF.						
2.3.7.3	The software must support streaming of video with Motion JPEG, MPEG4 and H.264 capabilities.						
2.3.8.1	The software must include the ability to integrate and control other ATMS-related field devices, such as dynam message signs, using NTCIP and other industry-standard open protocols.						

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2.4	**Graphical User Interface**						
2.4.1.1	The software must allow each user to configure and display views consisting of multiple windows.						
2.4.1.2	The software must allow each user to save and retrieve custom layouts with user-definable window sizes and content selection.						
2.4.1.3	The software must allow users to save and share views with other users so that they can be viewed on different workstations.						
2.4.1.4	The software must allow each user to configure and set their own default display preferences. The user's default display settings, including size of windows and displayed content, must be launched at the beginning of the user's session.						
2.4.1.5	The software must include the ability to display location and type of various ITS devices including at minimum video detection cameras and vehicle detection systems used for data collection, including detectors and links.						
2.4.1.6	The user interface must be context sensitive. For example, an event log of change history that is launched from a controller configuration screen should display change log data for only that particular controller.						
2.4.1.7	The software must include "undo" and "redo" functions						
2.4.2.1	Central software must support the display of GIS mapping integrated with device location and engineering zones boundaries.						
2.4.2.2	All zoom levels must indicate the status of each intersection in real or near-real time and visual representation of coordination links between devices.						
2.4.2.3	Zoom level increases must reveal additional details for intersections including, but not limited to: signal indication (red, yellow, green) intersection details, detector, phase, operating mode (e.g., Free, Coord, TOD, Manual, Failed, Flash), preemption, and coordination status and access to the report menu.						
2.4.3.1.1	The software must provide a real-time intersection graphic with an aerial view of the site and graphic overlays that display the current state of movements including signal colors or overlap status, active coordination pattern, active preemption status, pedestrian indications, and communication status.						
2.4.3.1.2	Display must provide a real-time intersection detector I/O for all detector and PED calls. Display includes fault and inoperative real-time status.						
2.4.3.2.1	The software must be able to update the status and timing values of all controllers at least once per second. The global update rate and the update rate used for each controller must be configurable.						
2.4.4.1	The software must be able to provide read-only and read/write access to all programmable features within the controller based on user-specific privileges and/or system jurisdictions Coordination Displays.						
2.4.4.2	The software must include time/space diagrams with ability to display real-time, historical, and programmed timings for all intersections along the corridor.						
2.4.4.3	Feedback must include progression and green band values for each direction						
2.4.4.4	The software must include a graphical representation and associated values of all timing phases.						
2.4.4.5	Moving an intersection's offset must display the projected effect on the corridor						
2.4.4.6	The software must allow users to manipulate coordination settings by dragging the boundaries of graphical information presented on the time-space diagram. The software must prompt the user to confirm whether or not to save changes when the diagram is closed. If changes are made and saved to the central software database, the software must then prompt the user to select whether or not to immediately download and implement those changes to the associated controllers.						
2.4.4.7	The display dialog must allow time/space modifications to be downloaded and implemented in field controllers in one action along the corridor. Must allow to reset the changes to previous settings.						
2.4.4.8	The software must allow users to create multiple coordinated corridors for one intersection and define the coordinated phase as needed.						
2.4.4.9	The display dialog must allow corridor speed limit values modifications "on the fly" to be downloaded and implemented in field controllers along the corridor.						

A	B	C	D				G
No.	Function	NTCIP Object Code (If Compliant)	Compliance OB - Meets requirement "out of the box" CNF - Meets requirements with special configuration CST - Meets requirements with custom software code NAV - Not available				Comments (attach additional sheets as necessary)
			OB	CNF	CST	NAV	
2.4.5.1	The software must automatically monitor and provide real-time communications status, provide notifications when communication is lost and restored, be able to report link uptime, and maintain a log of communication-related events.						
2.4.5.2	The software must provide a graphic display for communication performance based on dropped packages						
2.4.5.3	The software must provide a unified field form to automatically monitor and provide real-time signal status summary display for each intersection consisting of online status, communication failure, conflict, flash, police control, free, coordinated, transition, preemption, and maintain a log of status-related events. Real-time status of all intersections must be displayed in a single tabular form that is fully searchable by any of its primary fields consisting of asset number, location, status and alarm type. The form must also provide filters to facilitate selecting the type of conditions including all alarms and failures that are displayed.						
2.4.6.1	The software must include a help file that provides an overview of system features, descriptions of system software screens, and instructions on how to use the system to perform tasks.						
2.4.6.2	The help system must be context sensitive. If the help file is accessed by the user from while a particular software dialog, window, or setting is in focus, the help topic on that dialog, window, function, or feature will display.						
2.4.6.3	Help file must be editable by Authorized Client User to allow for updating and customization.						
2.4.6.4	The on-line help system section must be kept up to date with all features and functions and must be context sensitive with the current version installed.						
2.5	**Access, Security, and Administration**						
2.5.1.1	The software must not limit the number of user accounts						
2.5.1.2	The software must not limit the number of client installations or concurrent connected clients.The software performance must not degrade when the number of concurrent clients is connected and when the number of concurrent clients increases						
2.5.1.3	The software must support the configuration and use of multiple security level groups for administrators and users.						
2.5.1.4	The software must support the use of Microsoft Active Directory for account access and user management.						
2.5.1.5	The software must allow administrators to create user definitions that include assignment of geographical or other defined regions/corridors to user accounts.						
2.5.1.6	The software must allow user accounts per jurisdictions to be granted read-only and read- write permissions for access to system features and functions, including system settings, controller settings, upload/download, scheduling, and reporting.						
2.5.1.7	The vendor must complete the ITD Enterprise Security Matrix. This document will be sent to IT Security for review via a remedy ticket.						
2.5.2.1	The software must provide the user the ability to add and remove devices from the main map.						
2.5.2.2	Adding devices can be performed by selecting an existing device to copy it and then pasting the new device to its location.						
2.5.2.3	The software must allow authorized users to remove devices by selecting an existing device and pressing "Delete".						
2.5.3.1	The software must allow users to assign field devices, such as controllers, to groups. The software must allow users to administer and manage multiple field devices by group						
3	**Intersection Control Functions**						
3.1.1	The software must provide the ability to use Time of day (TOD) and Day of Week (DOW) scheduling and commands as specified in the Controller Software specification						
3.2.1	The system must support traffic responsive operations						
3.2.2	Software must utilize the USDOT traffic-responsive algorithm						
3.2.3	Users must be able to define volume and occupancy thresholds to suit the coordination plan.						
3.3.1	The software must support Adaptive Traffic Control features and functions						
3.3.2	The system must retain a historical record of system timing changes and adjustments resulting from adaptive traffic control features and functions.						
3.3.3	The system must allow the configuration of multiple zones that can include multiple intersections for zone-based adaptive control configuration, activation, and operation						
3.3.4	The system must allow scheduling of adaptive control operation						
3.3.5	The system must revert to normal or local time-of-day operation if adaptive operation terminates due to communication failure.						
3.3.6	Adaptive Control must allow alternate phase sequence based on traffic demand						

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			OB	CNF	CST	NAV	
3.3.7	Adaptive Control must allow phase re-service based on traffic demand						
3.3.8	Adaptive Control must support transit signal priority functionsand preemption.						
3.4.1	The software should be able to use a manual command to run any user-defined and system-defined reports.						
3.4.2	The software must allow manual command to override any scheduled event						
3.5.1	The software must support user selected route-based pre-emption using data received from third-party fire-rescue dispatch systems.						
4	**Database Management**						
4.1.1	The central software system must utilize Microsoft SQL Server 2019 or newer.						
4.1.2	The software must create and periodically update a backup database that can be used for system restoration and controller setting restoration. The full and partial backup frequency must be configurable system wide or individual locations						
4.2.1	The software must allow the user to perform complete and partial uploads and downloads of each controller's database.						
4.2.2	The system must provide users the ability to perform database comparisons between controllers and previous back-ups.						
4.2.3	The system must allow users to compare a database uploaded from a field controller to the database on file for that controller in the central software.						
4.2.4	The system must be able to automatically compare central and field controller databases for mismatch on a daily basis and generate a daily report.						
4.2.5	The software must provide for a user-defined clock synchronization scheduled command. Clock synchronizatio must include options to sync with an NTP, the central software or other uniform server to ensure all devices are coordinated to the same time.						
5	**Event Logs and Reports**						
5.1.1	The software must log all data entry and changes made in the system. The log must include the user ID, the date and time of the entry or change, the original data, and the new/modified data entered by the user						
5.1.2	The software must log all uploads and downloads involving configuration changes						
5.1.3	The system must have user activity and event log capabilities. Retention and archiving requirements will be defined by MDC.						
5.1.4	The system must monitor and log field device status and health including, but not limited to, logging changes in field device operation (e.g., free, coordinated, etc.), detection malfunctions, and cabinet access.						
5.2	**Reports**						
5.2.1	The software must provide system and operational reports with filters for data selection. The software must provide reports including but not limited to: communication status reports, coordination status reports, configuration summary reports, user activity reports, intersection timing reports, detector data reports, event reports, preemption reports, error reports, and performance measure reports. The users must be able to export any data from database to Microsoft Excel, or any other editable formats, such as CSV. The reports must also be able to export in .pdf format and and published to a signal status dashboard.						
5.2.2	The software must allow Administrator to have the ability to schedule and deliver report to group of individuals. Administrator or authorized user must have the flexibility to generate reports on demand ad-hoc or scheduled to run automatically at predefined intervals.						
5.2.3	The software must allow users to create and save customized reports and report templates.						
5.2.4	Report templates must allow users to run reports with preset parameters quickly.						
5.2.5	The software must allow users to setup reports to run automatically						
5.2.6.1	Communication status must include historic repetitive failure rate information						
5.2.6.2	Communication status must include device communications configuration						
5.2.7.1	The software must provide information for scheduled coordination patterns, and log all transitioning and free operations due to coordination errors.						
5.2.8.1	The software must include user defined customizable reports that detail configuration summary of all devices monitored by the system.						
5.2.9.1	The software must log all user activities including, but not limited to, user ID, date, time, activity and user specific information on a custom report.						
5.2.10.1	Reports must include scheduled timing plans, real time phase logs, manual command override, and changes to schedule plans as minimum.						
5.2.11.1	Detector Data Reports configurable by TOD, including but not limited to occupancy, volume and detector calls data.						
5.2.12.1	Reports must include schedule events, manual command override, and changes in scheduled events as minimum.						

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			OB	CNF	CST	NAV	
5.2.13.1	Reports must include type of pre-emption, pre-empted phase and number of instances as minimum						
5.2.14.1	The software must provide error reporting capabilities for devices, detection, communications, system, and network as minimum.						
5.2.15.1	The software must provide MOE reports including information such as percentage green used, cycle length, and plan summaries. Performance measure reports must support the use of controller high resolution data logging enumerations as a data source						

Exhibit 10

Requirements Traceability Matrix (RTM)

1. INTRODUCTION

This Requirements Traceability Matrix (RTM) is to be used to identify where the ATMS RFP Response and Requirements are addressed in the Successful Proposer's proposal.

For each requirement, the Successful Proposer is directed to identify where each RFP requirement is addressed by referring to the RFP's Section number, Attachment number, Page Number, and Paragraph Number. It is recommended that should an RFP requirement be met in more than one response section, that all applicable response sections be listed.

2. REQUIREMENTS TRACEABILITY MATRIX

The ATMS RFP identifies the RFP Requirements. RFP Tables 1 to 8 and 10 to 12, repeated here, presents the Requirement and contains the following columns:

- Column 1, ID. Indicates the unique requirement identifier. The ID # should not be modified in a proposal.
- Column 2, Requirements. The Requirements should not be modified in a proposal.
- Column 3, Deliverable. The Deliverable should not be modified in a proposal.
- Column 4, Section/Appendix #. This column should be updated for each requirement to indicate the Section or Appendix where the response can be located.
- Column 5, Proposal Page Number. This column should be updated as part of the proposal to reflect the page number in the proposal where this requirement is discussed.
- Column 6, Paragraph #. This column should be updated as part of a proposal to indicate where on the page that the response can be located.

Successful Proposer are expected to provide an updated version of this Attachment containing the Section/Attachment Number, the Page Number, and the Paragraph Number for each of the requirements in the table below as part of their proposal.

ATMS Requirement Traceability Matrix

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-1	The Successful Proposer must refine and deliver its proposed project plans consistent with agreements made during contract negotiation. The plan must address all requirements necessary to complete the work required by each TASK GROUP and include: • Kick-Off Agenda • RACI (Responsible, Accountable, Consulted and Informed) Chart Matrix • Roles and Responsibilities • Work Breakdown Structure • Project Schedule • Budget • Countywide Implementation and Transition of TG1 and TG 2 • Countywide Implementation and Transition of TG3 (Optional Services) • Traffic Controller Deployment Sequence Plan (to include approach to re-use of the existing 2070 LX controllers) • Controller Deployment Plan • Functions Plan • Phasing of Task Groups • Quality Assurance/Quality Control • Risk Management • Risk Register • Change Management • Acceptance Management • Issue Management and Escalation • Communication Plan • Monitoring and Reporting • Training • Efficient scheduling of critical path activities for all Task Groups. • Closure Plan (Including Documentation, Knowledge Transfer and Responsibilities regardless of the contract's status.	Necessary	Project Plan			

	The Successful Proposer must thereafter maintain and manage the project plan.					

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-2	The Successful Proposer must refine and deliver a project staffing plan that identifies individual project team members assigned to each of the project TASK GROUPS. The Successful Proposer must thereafter maintain and manage the Project staffing plan, including efforts to meet any applicable contract goals.	Necessary	Staffing Plan			
C-3	The Successful Proposer must develop and deliver a system architecture design document that describes the overall system architecture in terms of network, redundancy, system performance, security, system, hardware, software, tools, peripherals, software licenses, and the logical distribution of system components and processes across the architecture. (Optional Services)	Necessary	System Architecture Design			
C-4	During System Configuration, the Successful Proposer must deliver system security design documentation describing the logical security architecture design, the physical security architecture design, and the design of all controls to be used to mitigate threats to the confidentiality, integrity and availability of the system and system data.	Necessary	System Security Design			
C-5	The Successful Proposer must identify and document the database schemas, file formats, data views, an entity relationship diagram, and data dictionary for the system. (if applicable, for the traffic controller software) (Optional Services for ATMS central software).	Necessary	Database Documentation			
C-6	The Successful Proposer must provide a programmer's manual for any language-independent application programming interface (API). (if applicable, for the traffic controller software) (Optional Services for ATMS central software).	Necessary	Programmer's Manual for API			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-7	The technical documentation must include: • detailed specifications for hardware and software components • system performance expectations • data conversion approach	Necessary	Technical Documentation			
C-8	The Successful Proposer must document test plans defining: • the overall strategy for validating the functionality of the system • the approach to ensure test coverage of each requirement • the individual test cases that will be performed to execute the testing strategy • the environments in which the tests will be conducted The test plans must include: • testing objectives • scope of testing (both what is in and what is out of scope) • responsibilities (who will be performing the test) • testing approach • testing sequence • defect reporting and criteria	Necessary	Test Plans			
C-9	The test case descriptions must be traced to requirements and include: • test data needed to execute the tests • preconditions required prior to the start of test • criteria for suspending and resuming testing • expected test results	Necessary	Test Case Descriptions			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-10	The Successful Proposer's Consultant must convert existing signal timing databases to the format specific for the new local controller software. The converted databases must ensure proper clearance intervals and safe signal operations. Substandard clearance intervals must be recalculated and adjusted by the Contractor's Consultant. Any other signal timing parameters impacted by clearance interval modifications must be evaluated and adjusted by the Contractor's Consultant. Additionally, the databases must maintain the same signal operational functions as the existing signal controllers. (Optional Services)	Necessary	Signal timing database			
C-11	The Successful Proposer's Consultant must provide updated intersection signal timing documentation for each intersection which must be signed and sealed by a Florida registered professional engineer.	Necessary	Updated Signal Timing Documentation			
C-12	The Successful Proposer's Consultant must provide data entry of all data necessary to populate the ATMS on the Pre-Production and Production Environments	Necessary	Approved entry of system data			
C-13	During System Construction, the Successful Proposer must deliver test results including detailed outcomes for the following: • data migration tests (Optional Services) • system tests (including performance tests) • security tests (if applicable)	Necessary	Test Results			
C-14	During System Construction, the Successful Proposer must deliver test results that identify the version of each software component tested.	Necessary	Test Results			
C-15	During System Construction, the Successful Proposer must deliver test progress reports that include: • number of defects identified in testing • types of defects found • status of corrective actions	Necessary	Test Progress Reports			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-16	During System Construction, the Successful Proposer must deliver a validated system in the Pre-Production environment, to include the installation and integration of all ATMS components. (Optional Services)	Necessary	Validated Pre-Production System			
C-17	During System Construction, the Successful Proposer must update and deliver technical documentation to include corrective actions implemented as a result of testing activities.	Necessary	Updated Technical Documentation			
C-18	During System Construction, the Successful Proposer must develop and deliver the following user documentation: • User Manual • Database Administrator Manual, including installation and upgrade guides (Optional Services) • Troubleshooting Procedures and Maintenance Manual • System Administrator Manual • FAQs and scripts for technical support staff • Documentation on how to incorporate customizations during system upgrades	Necessary	User Documentation			
C-19	During System Construction, the user manuals must include a collection of printable on-line documentation designed to instruct users in the operation of the System.	Necessary	User Documentation			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-20	The Successful Proposer must prepare a comprehensive acceptance test plan for review and approval by the County. The plan must serve as a guide to operationally test system hardware, software and integration. The plan must include a detailed description of the tests to be conducted and the purpose of each test. Each test should be mapped to at least one of the functional requirements. Test procedures, including specific steps and the sequence of steps to be followed, must be specified.	Necessary	Test plan			
C-21	The acceptance test plan must include evaluation criteria for each test based on the functional requirements matrix. The criteria set forth by the plan will be used as the standard by which the County will judge the success or failure of each test.	Necessary	Test plan			
C-22	A testing schedule must be included in the acceptance test plan. This schedule must demonstrate the order in which tests are to be performed as well as the expected duration of each test. Allocate reasonable durations for the County validation of test results.	Necessary	Test schedule			
C-23	During System Acceptance, the Successful Proposer must deliver final test results for the following: • data validation results • data migration (Optional Services) • acceptance test results (including performance tests) • security and vulnerability test results (if applicable)	Necessary	Test Results			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-24	During System Acceptance, the Successful Proposer must deliver an accepted operational System.	Necessary	Accepted System			
C-25	During System Acceptance, the Successful Proposer must deliver an accepted and migrated data in the system. (Optional Services)	Necessary	Migrated Data			
C-26	The Successful Proposer must deliver an operational, accurate and formally accepted System to the County. This includes, but is not limited to: populating intersection data, creating Time Space Diagrams, categorizing intersections created, etc. (Optional Services)	Necessary	Operational System			
C-27	The Successful Proposer must deliver approved installation scripts/tools to the County. The Contractor must deliver approved data migration scripts/tools to the County (Optional Services)	Necessary	Installation & Migration Scripts/Tools			
C-28	The Successful Proposer must install and deploy the system in accordance with the approved Project Implementation and Transition Plan.	Necessary	Operational System			
C-29	The Successful Proposer must conduct knowledge transfer in accordance with the approved training requirements.	Necessary	Knowledge Transfer			
C-30	The Successful Proposer must prepare a training plan for the central ATMS central software (Optional Services), controller hardware and software and the network.	Necessary	Training Plan			
C-31	Training must be conducted at the County's TMC, traffic signal shop, and field locations as appropriate.	Necessary	Training Plan			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-32	The Successful Proposer must provide qualified instructors for the training.	Necessary	Training Program			
C-33	Upon completion of the training, all training materials will become the property of the County. The Successful Proposer must provide the County with all changes and revisions to the training manuals and other training documentation. Training materials shall be tailored to the operational role of the trainee (i.e., operator, area engineer). System and controller manuals shall be used as supporting documentation for training not as the training materials.	Necessary	Training Materials			
C-34	The Successful Proposer must provide assistance to the County to implement an ATMS training environment in the Pre-Production Environment). (Optional Services)	Necessary	Training Environment			
C-35	The Successful Proposer must provide the capability to refresh the ATMS training environment for each training session. (Optional Services)	Necessary	Training Environment			
C-36	The Successful Proposer must deliver sufficient multiple sessions to accommodate the number of users identified by the County and to allow for the fact that TMC coverage needs to be maintained during the trainings.	Necessary	Training Program			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-37	The Successful Proposer must refine and deliver a training plan identifying the: • Schedule for all role-based training sessions • Successful Proposer-provided resources to deliver training • Training evaluation collection, analysis, and improvement process • Success metrics identification, collection, and evaluation process • Expected training results • Post Training Support	Necessary	Training Plan			
C-38	The Successful Proposer must develop customized Systems role-based training and materials for each role. Role based training materials may include: • Participant Guidebooks (Printed and Electronic) including exercises • Instructor Guidebooks (Printed and Electronic) including exercises and answers • CD's containing the Participant Guidebooks in MS Word and PDF format • CD's containing the Instructor Guidebooks in MS Word and PDF format • PowerPoint Presentations • User Manuals • On-Line Help	Necessary	Training Materials			
C-39	The Successful Proposer must update impacted training material whenever software changes, including customizations, affect the operation of the software.	Necessary	Training Material Updates			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-40	The Successful Proposer must follow the Contract Agreement that will cover the System from the final acceptance of the System. The operational support covers the following: • Remote diagnostics • Technical support from the Successful Proposer • On-site issue resolution if necessary • Fixes to the software (updates, upgrades, security patches, etc.) • Updates to user, technical, and training documentation to support software changes resulting from fixes	Necessary	Maintenance Agreement			
C-41	The Successful Proposer must provide technical and system support for end-users 24 x 7 x 365.	Necessary	Technical Support			
C-42	The Successful Proposer must comply with the Service Level Objectives provided in Table 9 below.	Necessary	Technical Support			
C-43	The Successful Proposer must: • Propose a backup and recovery process which meets County's requirements • Recommend disaster recovery (DR) processes (Optional Services) • Provide instructions for business continuity (BC)	Necessary	Backup & BC/DR Processes			
C-44	The Successful Proposer must provide County personnel with access to an enhancement-tracking system.	Necessary	Enhancement Tracking System Access			
C-45	The Successful Proposer must provide County personnel with access to a System bug-reporting and defect-resolution system.	Necessary	Defect Tracking System Access			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-46	The Successful Proposer must attend on-going support status meetings with County personnel, as needed.	Necessary	Technical Support			
C-47	The Successful Proposer must periodically (at least once per year) provide the County with the software release schedule for any System off-the-shelf software components.	Necessary	Software Release Schedule			
C-48	The Successful Proposer's Consultant must submit the 90% plans, signed and sealed final plans, and signed and sealed as-built plans. Also include as signed and sealed detection channel form per intersection. These documents must be signed and sealed by a Florida PE.	Necessary	Signed and sealed as-built signal plans			
C-49	The Successful Proposer's Consultant must provide updated signal SOP document and timing sheets (e.g., controller timing reference table) for each intersection if there are any traffic signal operational changes as required by the current MDC design guidelines. These documents must be signed and sealed by a Florida PE.	Necessary	Signed and sealed SOP documents			
C-50	The Successful Proposer must submit field deployment checklist(s) for each intersection.	Necessary	Controller Deployment documents			
C-51	The Successful Proposer's Consultant must provide technical documents of detection placement, as defined in TASK GROUP 2, for implementation TASK GROUP 3 solutions. These documents must be signed and sealed by a Florida PE.	Necessary	Detection placement assessment document			
C-52	The Successful Proposer's Consultant must provide an updated listing of traffic signal Sections as described in TASK GROUP 1 (Section 2.02 B). A draft report including the description of grouping criteria and the updated Section listing must be provided to the County	Necessary	Signed and sealed Report			

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
	within 90 days after Notice to Proceed. These documents must be signed and sealed by a Florida PE. (Optional Services)					
C-53	The Successful Proposer's Consultant must provide a report as described in TASK GROUP 3 (Section 2.04 C1) to the County for approval at least 90 days prior to the implementation of proposed solutions. These documents must be signed and sealed by a Florida PE. (Optional Services)	Necessary	Signed and sealed report			
C-54	Prepare and submit signed and sealed report for County approval documenting adaptive control and traffic responsive settings, parameters, established links and proposed database changes. (Optional Services)	Necessary	Signed and sealed report			
C-55	The Successful Proposer must request for and obtain approval from the County prior to appointing or replacing key personnel.	Necessary				
C-56	Should it become necessary to replace key personnel, the Successful Proposer must provide replacement staff members for key personnel with equal or superior skills and qualifications, with full authority to act in that position for full performance under the Contract, and with rates not to exceed those of the originally supplied staff member.	Necessary				
C-57	The Successful Proposer's project manager must serve as focal point of contact for the County regarding project status, meetings & reporting requirements.	Necessary				
C-58	The Successful Proposer's project manager is responsible for managing scope changes, and financial, administrative, and technical issues or concerns raised by the County.	Necessary				

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-59	The Successful Proposer must work in cooperation with the County and its designated authorized representatives to ensure proper coordination of the Project with other County initiatives.	Necessary				
C-60	The Successful Proposer's Consultant must have a minimum of five years of traffic signal engineering experience providing ATMS, Systems Integration, and implementation services using the proposed solution. The demonstrated experience must be commensurate to the scale and scope of the Project.	Necessary				
C-61	The Successful Proposer's Consultant's experience must be readily verifiable and within the last ten years.	Necessary				
C-62	The Successful Proposer's Consultant must be qualified by the Florida Department of Transportation in the following Rule 14-75, Florida Administrative Code Consultant Work Type Categories: 6.1 Traffic Engineering Studies 6.2 Traffic Signal Timing 6.3.1 Intelligent Transportation Systems Analysis and Design 6.3.2 Intelligent Transportation Systems Implementation 6.3.3 Intelligent Transportation Systems Communications 6.3.4 Intelligent Transportation Systems Software Development 7.3 Signalization	Mandatory				

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-63	The Successful Proposer's Consultant must be technically certified pursuant to Miami-Dade County Administrative Order 3-39 in the following main work class category and work class designations: 3.04 Traffic Engineering Studies 3.07 Traffic Signal Timing 3.08 Intelligent Transportation Systems Analysis, Design, and Implementation 3.11 Signalization 16.00 General Civil Engineering 17.00 Engineering Construction Management The Successful Proposer's Consultant (or qualified subconsultants) must be technically certified pursuant to Miami-Dade County Administrative Order 3-39 in the following main work class category and work class designations: 11.00 General Structural Engineering 13.00 General Electrical Engineering 15.01 Land Surveying 19.03 Highway Systems	Necessary				

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-64	The Successful Proposer's traffic signal contractor must meet the licensing and qualification requirements stipulated in Article 1.05 of Section 600 of the Miami-Dade County Traffic Control Equipment Standards and Specifications (General Provisions for Traffic Control Devices).	Necessary				
C-65	At all times, the Successful Proposer's traffic signal contractor must demonstrate that it has full-time personnel with the necessary experience to perform the Project's Scope of Work. This experience shall include work in successfully completed projects performed by the identified personnel whose bulk of work performed in the Public Right-of-Way is similar in detail of the construction work described in this RFP. Demonstrate the experience requirement by: a. Providing a detailed description of at least three (3) projects similar in detail to the Project's Scope of Work described in these Solicitation Documents and in which the Bidder's identified personnel is currently engaged or has completed within the past five years. List and describe the aforementioned projects and state whether the work was performed for the County, other government clients, or private entities. The description must identify for each project: 1) The identified personnel and their assigned role and responsibilities for the listed project 2) The client name and address including a contact person and phone number for reference 3) Description of work 4) Total dollar value of the contract 5) Contract duration	Necessary				

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
	6) Statement or notation of whether Bidder's referenced personnel is/was employed by the prime contractor or subcontractor, and 7) For completed projects, provide letters of certification of final acceptance or similar project closure documentation issued by the client and available Contractor's performance evaluations; or b. Pursuant to Section 255.20, F.S., the County may consider a proposed signal contractor in good standing, meeting the license requirements above, that has been prequalified and considered eligible by the Florida Department of Transportation (FDOT) under Section 337.14, F.S. and Chapter 14-22, Florida Administrative Code, to perform the traffic signal installation work described. Proposers seeking consideration of their traffic signal contractor under this sub-paragraph shall submit along with the Proposal Documents for review and consideration, current copy(s) of the proposed traffic signal contractor's FDOT Certificate(s) of Qualification in the Traffic Signal and Electrical Work Classes, Certification of Work Underway, and Status of Contract(s) On Hand.					
C-66	The Successful Proposer must appoint key personnel to be responsible for coordinating with the County and managing project activities. Key personnel include: • Project Manager • Task Group Manager • Technical Architect • Software Engineer	Necessary				

ID	Requirement	Priority	Deliverable	Proposal Section/ Appendix #	Proposal Page #	Proposal Paragraph #
C-67	The Project Manager must have a minimum of 10 years of verifiable experience overseeing ATMS projects and be a professional engineer licensed in the State of Florida and be readily available at the Traffic Signals and Signs Facility. In the event of a substitution, replacement staff with equal or superior skills and qualifications must be submitted to County for review and approval.	Mandatory				
C-68	The Task Group manager must have a minimum of 7 years of verifiable experience designing and implementing solutions required under the assigned Task Group and be a professional engineer licensed in the State of Florida. In the event of a substitution, replacement staff with equal or superior skills and qualifications must be submitted to County for review and approval.	Mandatory				
C-69	The Technical Architect must have a minimum of 5 years of experience designing and implementing ATMS solutions. In the event of a substitution, replacement staff with equal or superior skills and qualifications must be submitted to County for review and approval.	Mandatory				
C-70	The Lead System/Software Engineer must have a minimum of 5 years of verifiable experience leading system/software activities for the implementation of ATMS systems and be a professional engineer licensed in the State of Florida. In the event of a substitution, replacement staff with equal or superior skills and qualifications must be submitted to County for review and approval.	Mandatory				

Exhibit 11

System Engineering Documents for TASK GROUP I

Caltrans Model 2070LX Traffic Signal Controller Deployment Project

Concept of Operations

Technical Memorandum

November 10, 2016
Version 2.0

Prepared for:
Miami-Dade County
Department of Transportation and Public Works

Prepared by:

ATKINS

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	Nelson Castillo (FDOT/APCTE)	10/13/2016
Client PM Approval:		

Table of Contents

List of Tables

List of Figures

Acronym and Abbreviation List

AASHTO .....American Association of State Highway and Transportation Officials
APL .....FDOT Approved Products List
ATC.....Advanced Transportation Controller
ATMS .....Advanced Traffic Management System
AToMs .....ATMS Software previously developed for Miami-Dade County by F.R. Aleman
Caltrans .....California Department of Transportation
ConOps .....Concept of Operations
COTS .....Commercial-Off-the-Shelf
CPU.....Central Processing Unit
DTPW .....Department of Transportation and Public Works
FDOT .....Florida Department of Transportation
I/O .....Input/Output
IT.....Information Technology
ITD.....Information Technology Department
ITE .....Institute of Transportation Engineers
ITS.....Intelligent Transportation System
KITS.....Kimley-Horn Integrated Transportation System
NEMA.....National Electronics Manufacturers Association
NTCIP .....National Transportation Communications for ITS Protocol
QPL .....Caltrans Qualified Products List
TEES .....Transportation Electrical Equipment Specifications
TSS.....Traffic Signals and Signs
TSSQPL .....TSS Qualified Products List
TMC.....Traffic Management Center
WAN .....Wide Area Network

1 Overview

This document serves as the Concept of Operations (ConOps) for the California Department of Transportation (Caltrans) Model 2070LX Traffic Signal Controller Deployment Project in Miami-Dade County (County). The Project consists of the phased upgrade of the existing traffic signal controller system following the evaluation of the Caltrans 2070LX traffic signal controller through an evaluation project conducted along NW 36th Street from NW 7100 block west to NW 97th Avenue.

1.1 Identification

This ConOps is one of many documents developed for the Miami-Dade County Caltrans Model 2070LX Traffic Signal Controller Deployment Project and builds on the results of the Caltrans 2070LX traffic signal controller evaluation project conducted along NW 36th Street. The general goals of the evaluation project included:

- Support the consideration and evaluation process for available Caltrans Model 2070LX controllers;
- Develop all necessary specifications, systems engineering documentation, and other technical documents necessary for future procurement and deployment of a Caltrans 2070LX unit version controller;
- Identify all limitations in operations that can be attributed to the central software;
- Identify all potential limitations in operations that can be attributed to the use of existing traffic signal cabinets;
- Identify current and future needs of the region with respect to the ATMS, formulate an implementation strategy for regional ATMS upgrades; and
- Establish plans and technical documentation that will help guide subsequent traffic signal design and construction projects.

This ConOps applies to the traffic signal controller field element of the County's signal system and the ATMS associated with configuration, operation, and monitoring of these devices. Specifically, it addresses consideration given and steps taken towards the selection of the next generation controller that will replace the County's existing Model D170E traffic signal controllers before they become functionally obsolete.

1.2 Document Overview

This ConOps describes current conditions and proposed changes needed for the implementation of countywide signal controller upgrades and a new ATMS software package in Miami-Dade County, including the proposed environment of the system and proposed utilization by stakeholders and associated agencies. It communicates user needs and expectations and how future ATMS expansion and deployment in the region will support the needs of local agencies and maximize the efficiencies of the transportation network.

This ConOps document is written for stakeholders represented by the County DTPW Traffic Signal and Signs Division (TSS) including Division managers, engineers, operators, signal technicians, and technical analysts who operate and maintain the system; DTPW management staff in direct charge of TSS; the County Information Technology Department (ITD); and the Florida Department of Transportation (FDOT). This document may be shared with stakeholders identified throughout the project life cycle to convey project information and solicit input.

This document provides:

- An overview on the existing Model D170E controller
- The justification for upgrading to a new class of controller
- An overview on the proposed Model 2070LX replacement controller
- A description of the evaluation of the Caltrans Model 2070LX controller
- Information on possible next steps based on the outcome of the evaluation

The development and management of this ConOps is based on a number of guidelines and builds upon other documentation developed for the project, by the County and for the region, including:

- State and federal guidelines
- User needs documentation related to this project
- Local, regional, and national specifications and standards for traffic control systems
- FDOT Intelligent Transportation Systems (ITS) Strategic Plan

This ConOps is developed in accordance with guidelines and information published by FDOT. The FDOT systems engineering website, which details FDOT guidelines and systems engineering processes, is available online at:

- http://www.dot.state.fl.us/trafficoperations/ITS/Projects_Deploy/SEMP.shtm

Document sections provide descriptions of current conditions, proposed changes, and concepts for proposed systems, including:

- **Section 2 (Referenced Documents)** describes the external documentation referenced within this document.
- **Section 3 (Current System or Situation)** describes the current role and situation of the Model D170E controller in the Miami-Dade Traffic Control System.
- **Section 4 (Justification for and Nature of Changes)** describes the justification for and nature of the proposed changes; this chapter identifies deficiencies of the existing situation and the benefits of change.
- **Section 5 (Concepts for the Proposed System)** describes the proposed system that will result from the desired changes. This is a high-level description, indicating the operational features of the demonstration system when deployed.
- **Section 6 (Operational Scenarios)** contains operational scenarios for the demonstration system. A scenario is a step-by-step description of how the proposed system might

operate and interact with its users and its external interfaces under a given set of circumstances. The scenarios tie together all parts of the proposed system, the users, and other entities by describing how they interact.

- **Section 7 (Summary of Impacts)** describes the operational impacts of the proposed demonstration system on the users, developers, maintenance organizations, and support organizations.
- **Section 8 (Analysis of the Proposed System)** describes the benefits, limitations, advantages, disadvantages, and trade-offs considered for the demonstration system.

1.3 System Overview

The DTPW TSS Division operates and maintains over 2,900 signalized intersections on state, county, and local roads within the County's geographical boundaries.

The DTPW TSS Division staff monitor and manage these intersections from their TMC in Miami, Florida, using KITS software. Kimley-Horn and Associates have customized the KITS software for DTPW and a Kimley-Horn employee is on the premises full-time as part of the TMC staff to support system operation and maintenance. In order to concentrate the resources necessary to provide for a safe and effective system upgrade and integration, it is the intent of the DTPW TSS Division to utilize as much of the existing infrastructure as possible during the countywide deployment phase of new signal controllers and ATMS. This includes possible reuse of existing communications, detection, and signal controller cabinet hardware during the initial phase of the traffic signal system upgrade followed by a systematic upgrade of the aforementioned system peripherals to support all future traffic signal management objectives and functionalities required by the County.

Figure 1 provides a basic depiction of core traffic signal controller interfaces. The controller receives various inputs from, and sends outputs to, multiple devices and systems associated with intersection control and operation. For instance, the controller:

- Receives and stores traffic signal configuration parameters such as timing, coordination settings, and schedules;
- Processes inputs from sensors such as vehicle detectors, preemption systems, and manual control inputs;
- Provides outputs that control illumination of traffic signal modules;
- Receives and processes commands from the TMC;
- Logs events and reports them to the TMC;
- Sends and receives inputs to and from other intersection subsystems; and
- Processes inputs and adjusts intersection operation using parameters with preprogrammed values and ranges such as min/max times, gap times, and adaptive processes.

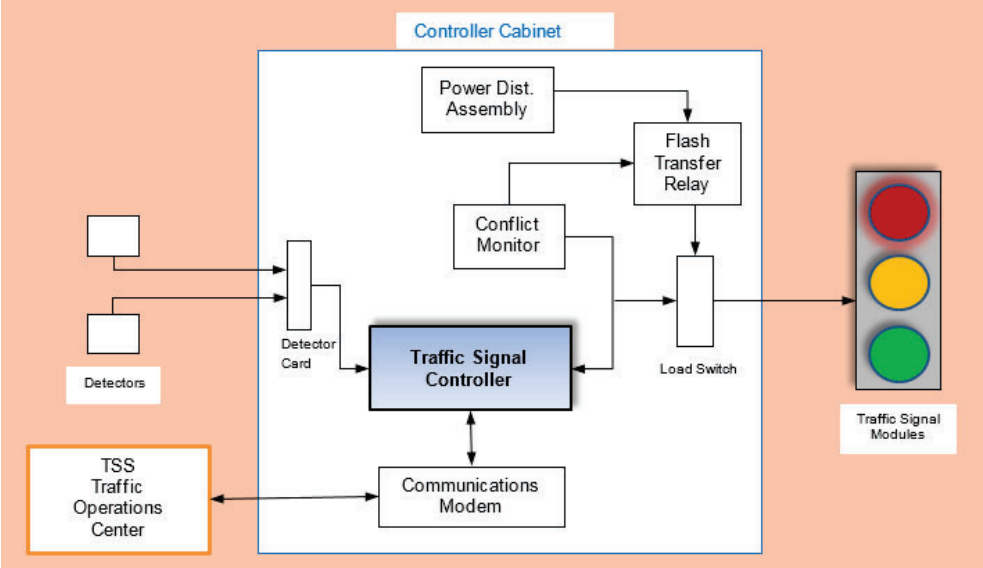

Figure 1: County Traffic Signal Controller Interfaces

2 Referenced Documentation

Table 2-1 provides a summary of standards, specifications, and other reference documents applicable to this project and ConOps.

Table 2-1: Referenced Documentation

DOCUMENT	DESCRIPTION	CONTACT / SOURCE
Florida Statewide and Regional ITS Architectures	Florida's Statewide ITS Architecture charts the current and future course of ITS deployment. A system-level document and database, it governs the planning, design, development, integration, implementation, maintenance, and operation of Florida's ITS projects.	http://www.consystec.com/florida/default.htm

DOCUMENT	DESCRIPTION	CONTACT / SOURCE
ATC 5201 v06.24: Advanced Transportation Controller (ATC) Latest Version	Developed and maintained under the direction of the ATC Joint Committee, which is made up of representatives from the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), and the National Electronics Manufacturers Association (NEMA); defines a minimum required functionality of hardware and software for ATC-conforming transportation controllers.	http://www.ite.org/standards/ATCcontroller/
National Transportation Communications for ITS Protocol (NTCIP) 1202: Object Definitions for Actuated Traffic Signal Controller (ASC) Units V02.19	Developed to be a Joint AASHTO/ ITE/ NEMA Standards Publication; describes the objects used for managing actuated traffic signal controller units.	http://ntcip.org/library/documents/
FDOT Standard Specifications for Road and Bridge Construction	Contains requirements for work, materials, and labor for all FDOT contracts.	http://www.dot.state.fl.us/programmanagement/Implemented/SpecBooks/default.shtm
Caltrans Transportation Electrical Equipment Specifications (TEES), 2009 and Errata	Developed and maintained by Caltrans; specifies, among other things, the requirements of the Model 170 and 2070 controllers including the Model 2070LX, supporting hardware, and compatible traffic controller cabinets.	http://dot.ca.gov/trafficops/tech/tees.html
Traffic Control Equipment Specifications and Standards for Metro Traffic Control System, Miami-Dade County	Requirements developed by Miami-Dade County for work, materials, and labor associated with the Miami-Dade Traffic Control System.	Miami-Dade County Public Works Department, Traffic Signals and Signs Division 7100 NW 36th Street Miami, FL 33166 http://www.miamidade.gov/publicworks/traffic-signals.asp

3 Current System Situation

The DTPW operates and maintains over 2,900 signalized intersections. The County currently uses the Model D170E traffic controller exclusively throughout their system. DTPW TSS Division staff monitor and manage these controllers from their TMC in Miami, Florida, using KITS software.

3.1 Background, Objectives, and Scope

The current iteration of the County traffic control system has been operational for over a decade. The primary components of the existing system architecture are traffic controller assemblies located at intersections throughout the County and the KITS ATMS software used for system configuration, monitoring, and operations. KITS was originally deployed in 2005, and has been subsequently maintained and enhanced through dozens of work orders as part of a $100M+ multi-year ITS contract between the County and Kimley-Horn. The County also still uses portions of their old legacy ATMS software produced by F.R. Aleman, AToMs, for inventory and asset management.

As technology and expected traffic control functions continue to evolve, the Model D170E traffic controller, a microcomputer developed in the 1990s, is rapidly becoming obsolete due to functionality limitations and difficulty in finding replacement parts. As a result, many agencies throughout the nation are upgrading to more modern controller models. As Model D170E controllers diminish in popularity and controller manufacturers place more emphasis on development and support of newer models, existing Model D170E controller maintenance and repairs will become increasingly difficult. Manufacturers will stop making replacement parts for some components of Model D170E controllers as they quickly approach end of life.

The Miami-Dade County Department of Transportation and Public Works (DTPW) determined that it is necessary to review and assess options and upgrade paths concerning their existing traffic signal controllers and advanced traffic management system (ATMS) software. The County currently uses the Model D170E traffic controller exclusively to control signalized intersections throughout their system and the DTPW Traffic Signal and Signs (TSS) Division staff monitors and manages all equipment at these intersections from their traffic management center (TMC) located at 7100 NW 36th Street, Miami, Florida, using Kimley-Horn Integrated Transportation System (KITS) software.

In anticipation of the inevitable functional obsolescence of the Model D170E controllers and in order to allow for new and improved controller functionalities, the DTPW TSS Division initiated a comprehensive review of alternative replacement controllers and eventually narrowed its research to the Model 2070 controllers originally developed by Caltrans as the successor to the Model 170 controller. From within the Caltrans 2070 family of controllers, the Caltrans 2070LX model class was identified by the DTPW TSS Division as the replacement controller that would best integrate into the County's existing traffic control system while providing the added functionalities needed to address future needs.

The scope of the evaluation effort involved deployment of modern traffic controllers along the NW 36th Street corridor. This deployment is expected to allow DTPW TSS Division staff to gain familiarity with the programming, operation, and maintenance of a Caltrans Model 2070LX class controller within their existing system infrastructure and explore new functionalities offered in modern traffic controllers. The evaluation project is also expected to help resolve issues encountered during deployment and integration so that they can be resolved prior to future countywide upgrades.

The current KITS ATMS owned by the County does not include support for the Caltrans Model 2070LX controller, which is considered to be the primary successor to the D170E. The County seeks to identify a cost-effective upgrade path for its existing system that accommodates current needs, extends the lifespan of the system, and provides additional capabilities, such as adaptive signal control and collection of signal performance metrics.

3.2 Operational Constraints

The focus of this project is expected to concentrate on traffic signal controllers and ATMS software. The DTPW TSS Division seeks to utilize as much of the existing infrastructure as possible during the deployment of new signal controllers and ATMS to provide a safe and effective upgrade and integration path. This includes possible reuse of existing communications, detection, and signal controller cabinet hardware during the initial phase of the traffic signal system upgrade followed by a systematic upgrade of system peripherals to support all future traffic signal management objectives and functionalities required by the County.

Operational constraints of the current system, as it relates to controller upgrade path, are primarily related to approaching obsolescence of existing D170E controllers and limitations in controller and advanced feature support by the existing ATMS. The version of KITS currently in use by the County is based upon use of the D170E controller type only and does not support communication with the 2070LX controller type identified as the most logical successor to the County's current D170E controllers. Similarly, the County's KITS software is currently limited to configuration, operation, and monitoring of the existing D170E controllers.

With respect to controller limitations and obsolescence, the ATC Joint Committee provides the following background and assessment of the Model 170 Controller in their Advanced Transportation Controller (ATC) Standard Version 06 (ATC 5201 v06.24), stating that:

> "The Model 170 obtains its hardware / software independence by requiring, by part number specification, the use of specific integrated circuit chips (for CPU [central processing unit] and Serial Communications functions). In addition, a memory map was defined so that software developers would know precisely where to address input and output functions regardless of who manufactured the hardware unit.
>
> While the Model 170's architecture has been enormously successful and achieves the desired independence of the hardware and software, the Model 170 relied heavily on the specific

Motorola CPU and serial communications chips (or suitable substitutes). Unfortunately, these chips have been designated for phased-out obsolescence. The issue is further compounded by the relatively poor computational performance of the Model 170, compared to today's controller systems. The applications software written for the Model 170 CU is written in assembly language which makes it difficult to move to a different CPU. Also, the Model 170, without a dedicated CPU for communications, cannot handle the performance demands of today's modern packet-based, high-speed communications networks. Few options currently exist for those agencies heavily invested in Model 170 software/hardware to preserve their investments in Model 170 applications software."

To overcome the operational constrains mentioned above, the County has decided to use a controller update path that will require the deployment of s new type of controllers and ATMS.

3.3 Description of the Current System or Situation

The traffic signal controller is a field element within the County DTPW - ATMS03-03_D46 Service Package of FDOT Districts 4 and 6 Regional ITS Architecture. Figure 2 is an illustration from the current FDOT Districts 4 and 6 Regional ITS Architecture website.

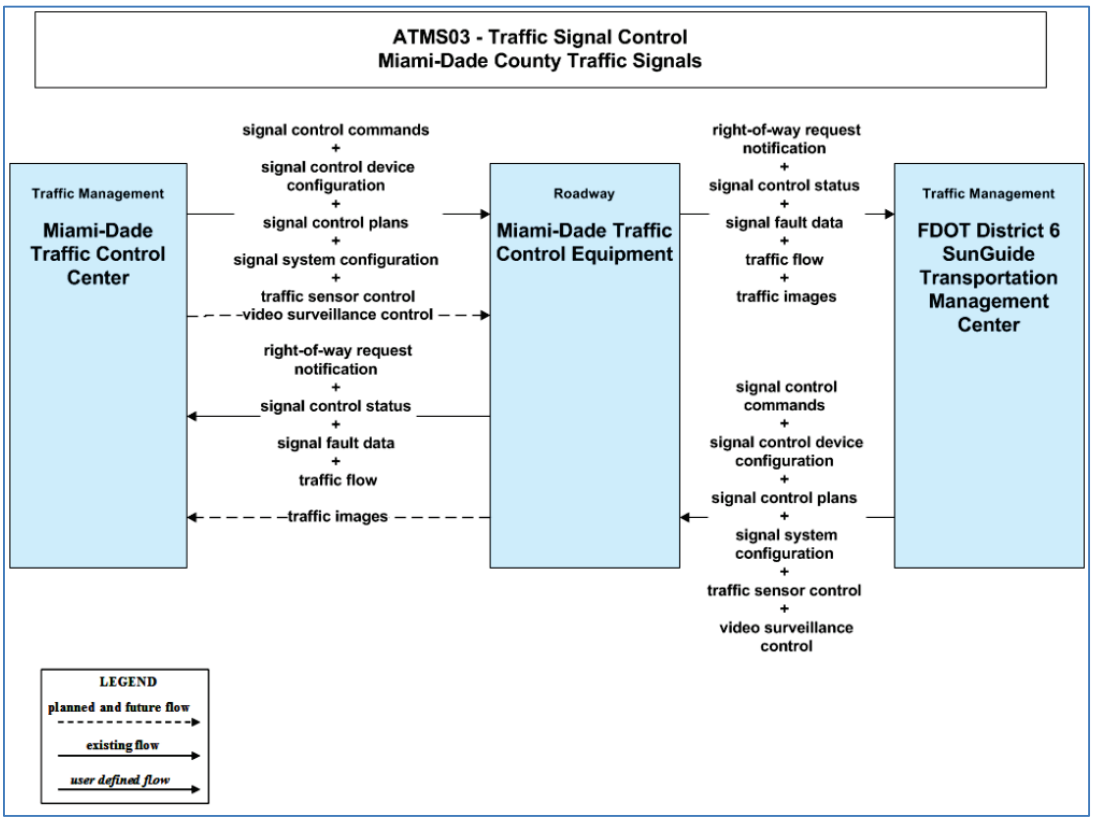

Figure 2: Service Package Diagram for Miami-Dade County Traffic Signals

The ATMS03 - Traffic Signal Control service package provides the central control and monitoring equipment, communications links, and the signal control equipment that support

traffic control at signalized intersections. A range of traffic signal control systems is represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests.

The Roadway Subsystem includes the equipment distributed on and along the roadway that monitors and controls traffic and monitors and manages the roadway itself. Roadway Subsystem equipment is separated into various equipment packages that include Field Management Stations Operation, Roadway Basic Surveillance, Roadway Equipment Coordination, and Roadway Signal Controls equipment packages. The Roadway Signal Controls equipment package includes the field elements that monitor and control signalized intersections and comprises the Miami-Dade Traffic Control Equipment element of the ATMS03 - Traffic Signal Control service package. It includes the traffic signal controllers, signal heads, detectors, and other ancillary equipment that support traffic signal control. Traffic signal controllers are a component of the Roadway Subsystem as illustrated in Figure 3.

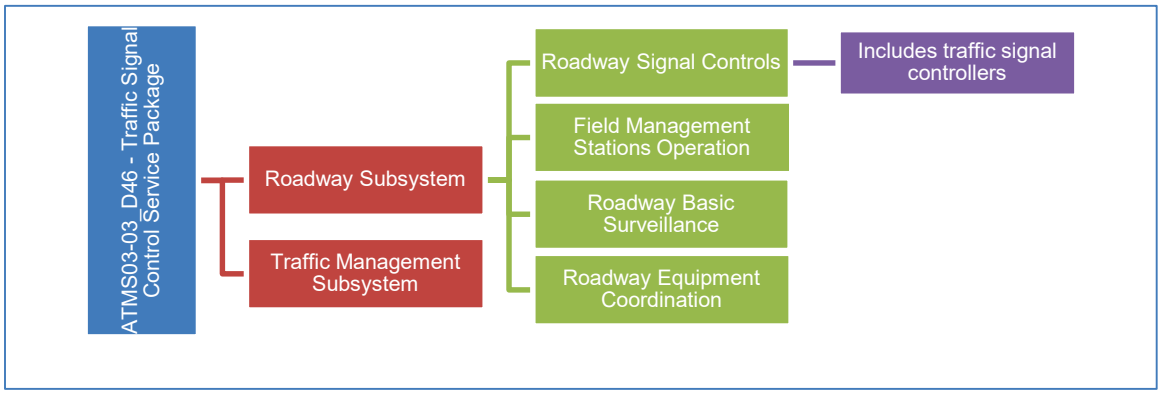

Figure 3: Relationship of Controller to Roadway Subsystems

County intersections utilize Model D170E traffic signal controllers and specialty controller cabinets designated as Types MD-552A, MD-552X, MD-660A and MD-660X. The County controller cabinet design has wiring and functional architecture similar to that of a Caltrans 332 traffic controller cabinet and is compatible with Model 170 controller units built to Caltrans TEES. The architecture of the current KITS ATMS software, including connections used for the configuration, operation, and monitoring of existing controllers, is shown in Figure 4.

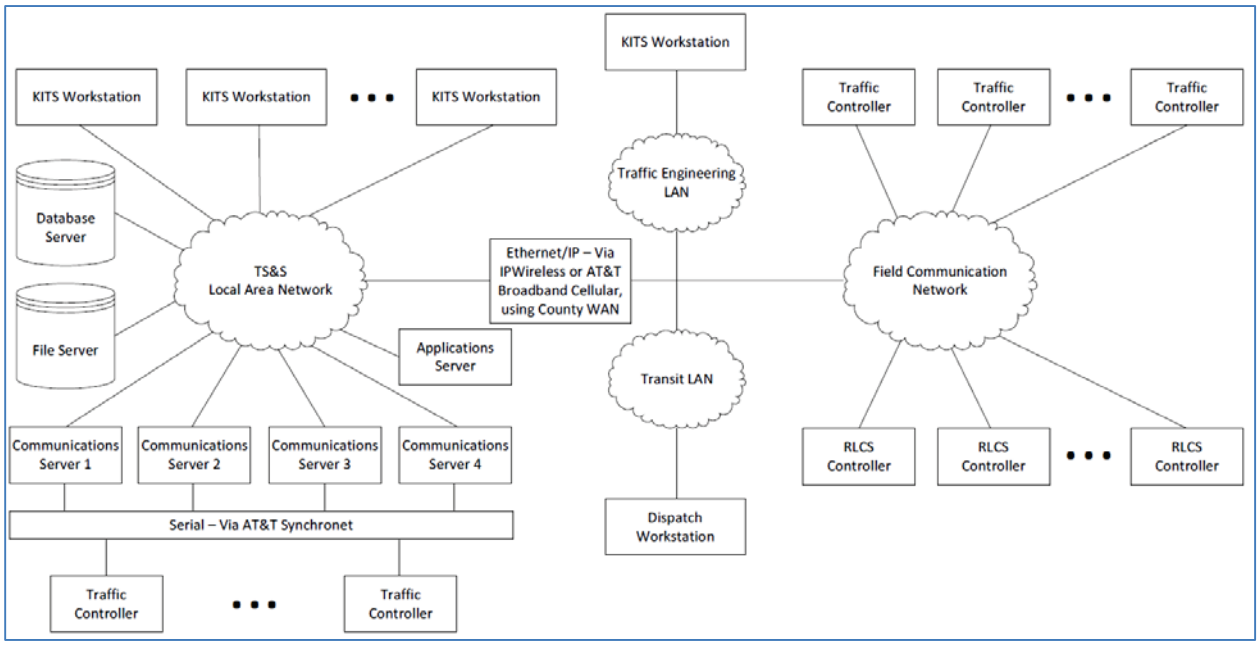

Figure 4: Existing Miami-Dade KITS Architecture

3.4 User Profiles

This section generally describes the roles of the County TMC system users and how they interact with the system. It also provides some examples of how users interact with the system and each other. For example, traffic signal engineers generate certain activities, such as signal timing changes, but require approval by a supervisor prior to implementation.

Division Chief – Manages the DTPW TSS Division and is also responsible for review and approval of traffic signal timings and other settings prior to download and implementation in the field. The Division Chief uses the ATMS software to access and view current and proposed controller configuration settings and notate/modify/approve changes.

Traffic Signal Engineer – Responsible for the day-to-day operations of the signal system. Tasks include responding to public comments, approving new signal turn-ons, assisting with general operation of the TMC, evaluating signal timing on existing arterials, managing signal operations staff, and coordinating with signal design and maintenance supervisors. Traffic Signal Engineers use the ATMS software to monitor and observe real-time operation of signalized intersections, including standard operations as well as transit signal and route preemption operations, upload/open/edit/save/download controller settings, adjust coordination settings along corridors, and generate reports that contain information on system status, system changes/adjustments, and current system/controller configuration settings.

Traffic Signal Technician/Analyst – Assists Traffic Signal Engineers with their day-to-day operations. Focus areas include signal timing and new signals. Traffic Signal Technicians/Analysts use the ATMS software to monitor and observe real-time operation of signalized intersections, upload/open/edit/save/download controller settings, adjust coordination

settings along corridors, and generate reports that contain information on system status, system changes/adjustments, and current system/controller configuration settings.

Traffic Signal Maintenance Technician – Generally responsible for troubleshooting and maintaining the physical traffic signal equipment. The Traffic Signal Maintenance Technician uses the ATMS software to monitor real-time operation of signalized intersections in order to diagnose potential problems prior to mobilizing crews for field repair.

ITS Engineer – Responsible for implementation of ITS projects. Tasks include responding to public comments, evaluating new products, assisting in the TMC, managing ITS contractors and vendors, and coordinating with the signal design and maintenance supervisors. The ITS Engineer uses the ATMS software to monitor operation, evaluate connection and operation of new products within the system, and assist with general operations and maintenance.

Electronic Specialist – Responsible for the complex electronic equipment at the heart of the signal system. Some tasks include:

- Traffic signal controller electronics testing, repair, and inventory
- Closed-circuit television system repair, field and central system
- Fiber optic cable system testing, repair, splicing, and termination
- Telecommunications systems maintenance and repair
- TMC systems maintenance and repair
- General system troubleshooting and device replacement/repair

TMC Network Administrator – The ATMS relies on various data networks for communication between system components. A dedicated TMC Network Administrator is responsible for ensuring that devices are properly configured for integration into the existing system (Internet Protocol address assignment, etc.); the networks and computer systems associated with the ATMS are reliable and in good working order; and network and connected devices comply with agency requirements and standards, such as those associated with security and use policies. This staff also provides general network, hardware, and application support to users.

3.5 Support Environment

The DTPW TSS Division uses a combination of County employees, on-site consultant staff, and contractors to manage and maintain the current system. This includes support from the DTPW Information Technology Department (ITD) for county computer systems and networks. It also includes consultant support for development of signal timing plans and the development and implementation of timing plans and coordination patterns by in-house staff. In addition to planned periodic re-timing studies, re-timings are also performed as needed in response to public concerns or problems identified by operators. The best practice for performing periodic retiming studies on a long-term basis is to do an analysis every three to four years.

It is expected that staff who already provide support for the existing systems and equipment will maintain the new equipment and systems. The signal system maintenance program is operated

from facilities collocated with the existing TMC and includes personnel and equipment assigned to typical signal maintenance program activities.

Traffic control system maintenance activities are often classified into three primary categories: functional-related, software-related, and hardware-related. Functional-related maintenance involves activities such as timing optimization and general changes in programming and configuration to improve transportation system effectiveness or efficiency. Software-related maintenance generally includes system updates and patches to enhance functionality or correct errors and "bugs" discovered during the course of system operations. Hardware-related maintenance involves preventive and corrective actions associated with traffic control devices, such as periodic inspection, maintenance, and repairs of intersection equipment and TMC hardware.

4 Justification and Nature of the Changes

Since the existing Model D170E traffic controllers used by the County are rapidly becoming obsolete, the County DTPW has determined that it is necessary to review and assess options and upgrade paths concerning their existing traffic signal controllers. The primary focus and desire of the County is to migrate from existing Model D170E traffic signal controllers to a new and more modern platform. The County expects that deploying new controllers will allow the system to continue serving the region's current transportation system needs, extend the functional and operational lifespan of the system, and support additional features and functions that will further enhance the effectiveness and efficiency of the regional transportation system.

The County has participated in a series of demonstrations focused on the next generation replacement for Miami-Dade County's aging traffic controllers. Based on the County's existing traffic control and maintenance infrastructure, and as a result of in-depth research coupled with information obtained during these demonstrations, a Model 2070 traffic controller that meets the current Caltrans TEES for a 2070LX unit version was determined to provide the most advantageous migration path for the majority of the County's traffic signal controllers.

The reasons provided for migrating to a Model 2070 controller, and specifically a Caltrans TEES Model 2070LX version, are summarized in the following points:

- Desired operational features are not readily possible with the Model 170 controllers.
- Hardware obsolescence makes continued use of the Model 170 controller a poor choice for long-term applications. As replacement parts stop being manufactured for some components, Model 170 controllers will have to be replaced. Caltrans developed the Model 2070 controller as its replacement.
- The 2070 specification is now mature, stable, and refined. All hardware components in an approved 2070 controller are standardized and interchangeable regardless of manufacturer.

- The 2070 is an open-architecture controller in that it can be adapted routinely for numerous standard cabinet types. Open architecture eases maintenance and ensures future compatibility.
- Traffic control software can be purchased separately (just as with the Model 170). As with the 170, hardware can be purchased from low bidders with confidence since the functionality is in the software. This advantage may allow for the possibility of purchasing software on an agency-wide license. Traffic control features and software costs are negotiated with a software supplier without tying up the hardware bidding process hence maintaining a competitive purchasing process for the hardware.
- Model 2070 controllers can be adapted to fit into the existing County controller cabinets. Any consideration of controller replacement must take into account the existing cabinet and any changes planned or needed to the cabinet.
- The Caltrans TEES 2070LX controller is an ATC implementation of the Model 2070 family of controllers that combines the advantages of the Model 2070 controllers and also meets the goals of the ATC Standards to provide an open architecture design for the next generation of transportation controller applications.

The KITS ATMS software used by the County is also tightly coupled with, and somewhat limited to, use with the current Model D170E controllers. Therefore, the County must also consider the impacts of a controller change on the continued use of KITS. While it is possible that KITS can be upgraded to support a newer controller type, the County is also interested in exploring commercial-off-the-shelf (COTS) alternatives to KITS. Therefore, the County wishes to use an evaluation that includes operating new controllers and ATMS software in a limited area to identify potential limitations in operation that can be attributed to the use of existing County traffic signal cabinets; identify limitations in operation that can be attributed to software; and support the preparation of all specifications and documentation needed by the DTPW for future countywide deployment of a more modern controller.

There is also a desire to upgrade the communication systems used by the ATMS throughout the county in order to establish an Ethernet-based wide area network (WAN) that will support current and future equipment used for countywide transportation system management and operations. Agency-owned WANs using enterprise and industrial Ethernet networking equipment and fiber optic interconnect remain the gold standard for reliability and capacity.

4.1 Justification for Changes

Hardware obsolescence makes continued use of the Model D170E controller a poor choice for new deployments and long-range plans as controller hardware components are obsolete, processing power is limited, and software is not compliant with new industry standards and open standards for communication, such as NTCIP. In addition, desired operational features are now readily available in new generation controllers. For these reasons, County stakeholders initiated

an effort to study the various alternatives available for a future replacement controller and identified the most suitable alternative to be the Model 2070LX.

The Model 2070LX controller is the newest controller type within the Caltrans controller family and offers a path that will allow the County to upgrade existing intersections to a modern, standards-based, higher performance controller platform without requiring replacement or significant rework of the County's existing controller cabinets.

4.2 Description of the Desired Changes

The County desires to deploy a modern traffic signal controller that is compatible with their existing traffic cabinet architecture and that will allow implementation and use of new capabilities, functions, and features. The desired changes expected to be addressed are the:

- Need to maintain current system functionality as described in section 1.3;
- Need to futureproof field controller hardware, insofar as practical;
- Desire for traffic controllers to use open standards-based hardware, software, and communication protocols;
- Desire for traffic controllers to support additional features such as adaptive traffic control and high-resolution data logging;
- Need to adjust operational policies, procedures, and methods to support and compliment new equipment and systems;
- Incorporation of new equipment into existing systems and operations;
- Need to gain additional hands-on experience with modern controllers and ATMS software alternatives; and
- Need to establish local criteria for future upgrades and improvements to intersections throughout the County.

A complete list of user needs has been solicited and compiled from multiple stakeholders, captured in a user needs database, and included in a User Needs Report produced as part of this project. These will be used in the future to update and develop county requirements for hardware and software associated with the ATMS.

4.3 Change Priorities

The County has identified establishing and operating an evaluation project along a section of the NW 36th Street corridor as the first priority in order to achieve the goals defined for the project in Section 1.1 of this ConOps.

The NW 36th Street corridor evaluation deployment allowed DTPW TSS Division staff to gain familiarity with the programming, integration, operation, and maintenance of a Caltrans Model 2070LX class controller within their existing system infrastructure. The intersections included in the evaluation are identified in Table 4.3-1.

Table 4.3-1: Intersection List

	Asset Number	Intersection Name	System Section
1	3830	NW 36 St ext & NW 7100 Blk	76
2	3163	Milam Dairy Rd & NW 36 St ext	76
3	5428	SR 826 NB & NW 36 St	199
4	5429	SR 826 SB & NW 36 St	199
5	3954	NW 79 Av & NW 36 St ext	199
6	4569	NW 82 Av & NW 36 St ext	257
7	6732	NW 36 St ext & NW 8300 Blk	257
8	4571	NW 36 St ext & NW 8400 Blk	257
9	4477	Galloway Rd & NW 36 St ext	257
10	4332	Galloway Rd & NW 41 St	257
11	4864	Galloway Rd & NW 33 St	212
12	5382	NW 93 Ct & NW 41 St	263
13	4885	NW 97 Av & NW 41 St	263
14	5440	Milam Dairy Rd & NW 31 St	76

The NW 36th Street corridor was selected for the evaluation project due to its close proximity to the DTPW TSS Division's TMC and signal maintenance shop; the fact that there are a variety of intersection geometries and configurations along the corridor; and the relatively consistent traffic volumes and patterns present.

This corridor is expected to provide a good environment to validate that new controllers can be installed into existing cabinets without degrading current operation and, subsequently, evaluate new features and functions such as adaptive signal control. A successful evaluation will form the basis of future system upgrades and expansion throughout the County using technologies and strategies in conformance with national, state, and regional architectures.

4.4 Changes Considered but Not Included

Several major and minor potential changes and solutions have been considered by DTPW in the process of formulating the current approach to this project. Significant items considered, but not included in the project, are described in the following subsections.

4.4.1 Alternative Controller Types

Existing County controllers and controller cabinets are based on the Caltrans TEES specifications. Controllers, cabinets, and other system components defined by TEES are commonly referred to as belonging within a "Type 170" product family. Controllers designed for

use in the Type 170 traffic control environment are characterized by their standard 19-inch, rack-mount hardware architecture, harness-based equipment interconnections, and adherence to Caltrans TEES and standards covering design, mechanical construction, input/output (I/O), functionality, and other product attributes. The Type 170 controller architecture is one of two system types used throughout the United States. The other common controller architecture is commonly referred to as NEMA since it is based on specifications and standards developed and maintained by NEMA.

The NEMA traffic control environment can be characterized by cabinet and I/O configuration also. NEMA cabinets typically use shelf-mount equipment and rely more on open terminal facilities for equipment interconnect and wiring harnesses. Modern NEMA controllers are built to the NEMA TS 2 standard that covers requirements including I/O, functionality, and other equipment attributes.

Bridging the gap between Caltrans and NEMA standards is a new standard, the ATC 5201 (v06.24) standard. The ATC standard focuses on interoperability of certain hardware components like the main processor board, the operating system, and interoperability of different vendors' software. The ATC 5201 standard does not limit cabinet interfaces, which is most of what the NEMA and Caltrans standards define. The goal of the ATC standard is to establish a controller type that will run NEMA-style cabinets, Caltrans-style cabinets, ITS cabinets, and proprietary cabinets, depending on customer needs and the hardware/software interfaces developed. The current trend amongst traffic controller manufacturers is to develop controllers that adopt the ATC standard and NTCIP standards while retaining either their NEMA or Caltrans capabilities. This allows users who are heavily invested in either NEMA-style or Caltrans-style systems to upgrade their controllers without requiring a cabinet change.

DTPW staff considered the possibility of migrating controller cabinets to another style, but ultimately determined that it would be in the County's best interests to utilize as much of the existing infrastructure as possible during the evaluation process and any subsequent countywide deployment of new signal controllers and ATMS software. This includes reuse of existing communications, detection, and signal controller cabinet hardware.

4.4.2 KITS Enhancements to Enable Type 2070LX Controller Support

It is possible for Kimley-Horn to implement changes within KITS in order to support new and different controller types. DTPW has requested an estimate of the work and cost associated with upgrading the County's KITS software so that it is able to operate with a 2070LX controller using NTCIP communications. If the County's KITS deployment already included support for NTCIP and operation with the 2070LX controllers currently on the market, the County would not be forced to research alternative COTS ATMS software packages in addition to field controllers. In fact, it would be preferable to operate KITS with both existing D170E controllers and the new 2070LX models since staff is already familiar with KITS for controller deployments, configuration changes, and daily operations. If KITS were able to seamlessly integrate both controller types into existing operations, there would be significantly less impact

on staff. Requiring that staff learn and use a new ATMS software in order to evaluate a controller presents challenges, as does evaluating the features, functions, advantages, and disadvantages of different ATMS software in addition to the evaluation of the field controller.

The County has decided to also investigate COTS ATMS software due to the fact that DTPW staff and management have expressed concern over the recurring cost of KITS ownership. DTPW believes that COTS ATMS software is now available that offers features and functions similar to KITS at a fraction of the cost. Pursuing a KITS upgrade for support of a newer controller was considered, but is not being included at this time. It may still be considered as an option in the future depending on the outcome of the initial evaluation project.

4.5 Assumptions and Constraints

The traffic controllers chosen for this project will need to be compatible with field components that are currently in use within the County's traffic control system. A project goal is to reuse as much of the existing intersection hardware and equipment as possible. The traffic signal controller and any other traffic control devices must be listed on FDOT's Statewide Approved Products List (APL), ensuring that they have been tested by FDOT's Traffic Engineering Research Laboratory and certified to meet FDOT's minimum requirements. Any ATMS software required for the operation of new controllers must coexist on the same network as the current County ATMS and provide functionality equal to or better than the current system.

5 Concepts for the Proposed System

The proposed system will be comprised of intersections retrofitted with modern traffic controllers and an ATMS software package that can communicate to field equipment using the County's existing communications networks. The existing networks include a combination of hardline and cellular connections. The field equipment used during the evaluation will rely upon 4G LTE cellular routers for communication with the TMC. The routers are expected to support controller communications with the ATMS software as well as transmit video streams from cameras at the evaluation intersections. They will be configured to prioritize controller communication traffic. If a single router cannot provide sufficient bandwidth and reliability for video streams and controller communications, multiple cellular routers will be installed at each intersection. Once the deployment of the evaluation phase along the NW 36th Street corridor is operational and deemed successful, additional projects comprised of planned phased deployments will be used to implement upgrades throughout the County.

The controller type identified by the stakeholders as the best possible candidate for replacement of the County's Model D170E controllers is the Caltrans Model 2070LX unit version. It combines the advantages of mature specifications applicable to Model 2070 controllers while meeting the primary goals of the new ATC standards. The Model 2070LX uses a Linux operating system and resident controller software produced by the controller manufacturer. As with the Model 170, software completely defines the functionality of the controller, and the controller can also run software provided by third-party developers. The 2070LX provides

features including the capability to perform adaptive traffic control with the acquisition of an optional module for controller and for central software; and provides high-resolution data to signal performance measure systems, which requires additional detectors to be installed for a typical intersection.

5.1 Background, Objectives, and Scope

The primary goals for the new system, particularly the evaluation project, are to identify and evaluate potential upgrade paths for the traffic signal controllers and ATMS software used in the County and to develop specifications and other documentation that will help advance future projects involving upgrades to the existing transportation system throughout the County. Associated activities include:

- Supporting and documenting the evaluation process for the controller
- Developing systems engineering documents and technical requirements
- Identifying limitations in operations attributed to software
- Identifying limitations in operations attributed to the use of existing cabinets

5.2 Operational Policies and Constraints

New traffic controllers, ATMS software, and other system components are expected to provide functional characteristics equal to or better than existing components. Major project goals are that the new system:

- Provides the same operational support as the existing County metro traffic control system,
- Extends the operational life of that new system, and
- Provides equipment that can support future operations such as adaptive signal control, automated signal performance measures, and connected vehicle applications.

The County wants future intersection upgrades, including changeovers to more modern traffic signal controllers, to have little to no impact on current operations. As such, the new system is expected to support operational characteristics identical to those currently in place. For instance, the new system will support TMC operations following the same operational hours as the existing system; utilizing existing staff for implementation, operation, and maintenance; and fitting within existing space available in field cabinets and the TMC.

5.3 Description of the Proposed System

The proposed system will consist of an evaluation project along a section of the NW 36th Street corridor as an evaluation phase to establish a proof of concept deployment. If successful, the evaluation project will serve as the model for future, similar upgrades throughout the County. This project is viewed as relatively low risk with a high likelihood of success. It utilizes COTS hardware and software that follows national standards and equipment that has been deployed in the past by multiple agencies around the nation. It involves limited equipment replacement and reuses much of the existing, time-proven hardware already in place to minimize disruption,

downtime, and potential operational impacts. If initial field trials of equipment uncover significant issues, the limited scope of deployment will allow relatively fast resolution. In a worst-case scenario, intersections can be reverted back to their previous condition until another upgrade path can be implemented.

Intersection upgrades will consist primarily of the replacement of the traffic signal controller. Upgrades to intersection detection systems will be performed as required in order to allow evaluation of new features and functionalities available within current generation controllers, such as adaptive traffic control features and high-resolution data logging. Detection system upgrades may include a combination of technologies (e.g., inductive loops, video detection, and wireless magnetometers). The proof of concept deployment is expected to include the addition of video detection at multiple NW 36th Street locations. In addition, Bluetooth readers will gather travel time information along the evaluation corridor before and after deployment to allow future analysis of changes in operation resulting from new equipment, new timing plans, and the potential implementation of other features during the course of the controller evaluation.

The current TEES 2009 (Errata 2) version designated as the Model 2070LX controller is comprised of the Model 2070 unit chassis, Model 2070-1C CPU, Model 2070-2E+ Field I/O (2070-2C if using an ITS cabinet), Model 2070-3B front panel, and the Model 2070- 4A power supply. On September 30, 2015, Econolite Control Products, Inc. submitted a Model 2070LX controller, which meets the aforementioned requirements, for the County's consideration and evaluation. At the time of this project's inception, this controller was the only product listed on both the Caltrans Qualified Products List (QPL) and FDOT APL. Therefore, an Econolite system has been selected as the first candidate controller in the 2070LX model class to be deployed for evaluation.

The proposed system will incorporate the Econolite 2070LX controller, Econolite Autoscope video detection that provides the additional detection needed for adaptive function, TrafficCast BlueTOAD detectors that provides data needed to establish a baseline and compare corridor performance mostly through travel times data, and Econolite Centracs ATMS software that provides integration to field equipment deployed as well as monitoring and operations.

Figure 5 illustrates the basic architecture of the proposed system.

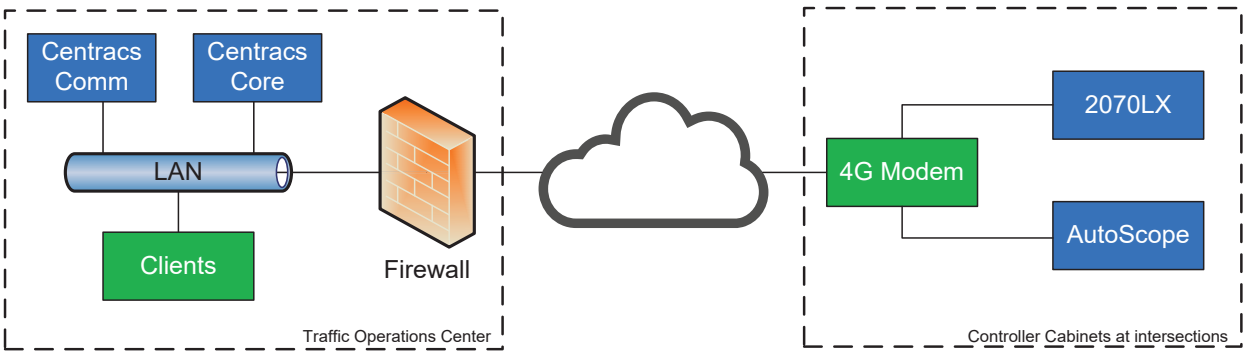

Figure 5: Basic Diagram of Proposed System

The proposed system must, at a minimum, maintain performance levels currently exhibited along the evaluation corridor as well as any roadways included in future system expansions. The controllers and ATMS software are expected to provide features and functionality equal to or better than those provided by existing systems. Bluetooth detectors will be used to help quantify before and after conditions for the purposes of the evaluation project.

The proposed system must also support interfaces to external systems. The proof of concept system will be used to determine the level of effort involved with integration of external systems, such as those currently used to trigger route preemption plans to clear routes for emergency responders.

This project is expected to conform and be compatible with the FDOT Districts 4 and 6 Regional ITS Architecture. It is currently listed in the architecture as a short timeframe project originally titled "Miami-Dade Adaptive Signal System Pilot." The preliminary proof of concept deployment and any subsequent deployments are considered to be portions of the conceptual project identified in the architecture.

The upgrade of signal controllers and ATMS software using a proof of concept approach with limited geographic area and COTS products described herein is considered a low-risk endeavor. The limited geographic scope of the initial deployment will allow any issues to be uncovered and addressed prior to widespread deployment at a relatively low cost. Establishing and operating the proposed system as part of an evaluation project along the NW 36th Street corridor will, therefore, reduce risks associated with future deployments throughout the County.

The proposed system is expected to provide reliability, accuracy, availability, expandability, flexibility, interoperability, maintainability, portability, reusability, supportability, survivability, and usability equal to or better than the existing system. It will also be configured in a manner consistent with County policies and procedures concerning safety, security, privacy, integrity, and continuity of operations in emergencies

5.4 Modes of Operation

The initial deployment and subsequent deployments will be expected to operate in a manner similar to the existing system, with no impact on current modes of operation including activities during normal business hours, after-hours, and during emergencies.

5.5 User Involvement and Interaction

User involvement and interaction with the proposed system is expected to be similar, if not identical, to their involvement and interaction with the current system. While the user interface of the controller and the ATMS software will be different, a primary goal of the project is that it will provide the same core functionality as the current system. Once the new system has been shown to provide the same operational capabilities as the County's old controllers and ATMS, advanced features of the evaluation system that are not currently available within KITS will be explored. This will likely introduce users to new operations and concepts.

The DTPW TSS Division identified existing staff with years of experience, technical knowledge, interest in new technologies, and familiarity with the many nuances of current operations who were actively involved in the evaluation project. Their input was solicited to identify user needs and will continue to be invaluable as this project progresses.

5.6 Support Environment

The DTPW TSS Division is responsible for the overall operation, management, and support of all traffic control systems and devices within the County. The DTPW TSS Division currently operates, supports, and maintains existing traffic control network systems and equipment, and is expected to support the proposed system in a similar manner. Like many agencies, the County also includes an ITD that provides services in areas of applications development and support, enterprise solutions, technology infrastructure and integration, IT security, geographic information systems, and computer/telecommunications to include radio support. ITD currently provides network and computer support at the request of DTPW when necessary, appropriate, and practical. TMCs typically have dedicated IT staff who work under the direction of the TMC manager. It is considered a best practice for IT support staff to work under the direction of the TMC manager due to the specialized nature of traffic control systems and devices as well as the need for quick response to network and computing issues impacting traffic operations.

6 Operational Scenarios

The operational scenarios for the proposed system are expected to mimic the existing system. The following examples illustrate typical operational scenarios.

6.1 System Monitoring

Users perform a number of tasks related to intersection monitoring. For example, System Operators perform a daily check of system status at the start of the first shift each day. The System Operator’s checks include the following steps:

- Check for intersections in flash due to fault using system status
- Check for communications failures using system status
- Check for detection failures using system reports
- Confirm or clear alarms based upon findings

Depending on findings, System Operators may escalate notifications and issues to Traffic Signal Operations Zone Engineers, and maintenance crews may be dispatched for additional investigation and corrective action as necessary.

Similarly, Traffic Signal Operations Zone Engineers use system reports and periodic real-time monitoring on a daily basis to ensure the proper operation of controllers under their jurisdiction and address items as they arise. Traffic Signal Operations Zone Engineer checks include reviewing system reports for disabled controllers, coordination problems, communications

failures, phase malfunctions, preemption information, temporary timing locations, and pending timing approvals.

Depending on findings, Traffic Signal Operations Zone Engineers may propose corrective actions and escalate issues to their supervisor, and maintenance crews may be dispatched for additional investigation and corrective action as necessary.

6.2 Intersection Timing Adjustments

Traffic Signal Operations Zone Engineers interact with the system to program and add new controllers to the system as well as adjust timings and other settings used by existing controllers. An example of Traffic Signal Operations Zone Engineers interactions with the system are activities related to timing adjustments and controller programming that include the following steps:

- Upload and compare field controller settings to database settings
- Use real-time monitoring functions to observe current operations
- Determine what timing changes are necessary
- Enter proposed timings into future timing database (or copy existing timings into future timing database and adjust)
- Download future timings to a test controller for observation if necessary
- Submit timings for supervisor review and approval
- Check status of future timing approvals
- Download approved timings
- Observe operation

Every single operation that involves changes to timing, needs to be approved by a supervisor prior to downloading data.

7 Summary of Impacts

Implementation of the proposed system will require that DTPW staff participate in the evaluation and, if successful, subsequent corridor-based deployments. This will require existing staff to become familiar with a new signal controller type and ATMS software. While every step will be taken to reduce risk, burden, and the impact of the evaluation and anticipated future system-wide upgrades, it should be understood that some temporary impacts will occur. For example, users will need to make time for training and familiarizing themselves with the proposed system in addition to performing their current duties. There will also be a need for coordination between County divisions and other impacted agencies. Project participants have been notified and engaged in the project already, so key stakeholders and staff are already well aware of future goals and plans for the system.

The additional work stemming from the general impact of field controller replacement, ancillary device installation, and installation of equipment required to run a second ATMS software

package within the TMC is expected during the transition period until all controllers have been deployed.

8 Analysis of the Proposed System

As for any new system, the analysis of the proposed system will be based on its benefits, limitations, advantages and disadvantages, alternatives, and trade-offs.

Some of the benefits and advantages of the proposed system are:

- The upgrade of signal controllers and ATMS software using a proof of concept approach with limited geographic area and the COTS products described herein is considered a low-risk endeavor.
- The proposed system is expected to provide reliability, accuracy, availability, expandability, flexibility, interoperability, maintainability, portability, reusability, supportability, survivability, and usability equal to or better than the existing system.
- The controller selected for the project is listed on both the Caltrans QPL and FDOT APL and, therefore, is known to meet state and national standards and requirements.
- Detection upgrade and data collection devices installed as part of the project will improve operations, performance, and analysis capabilities even with no new controller installed, by reducing delays, improving travel times, and improving data collection for performance measures.
- The initial deployment and subsequent deployments will be expected to operate in a manner similar to the existing system, with minimal impact on current operations.
- New traffic controllers, ATMS software, and other system components are expected to serve the same functions and provide the same operational support as existing County traffic control system components.
- The proposed system will be comprised of intersections retrofitted with modern traffic controllers and an ATMS software package that can communicate to field equipment using the County’s existing communications networks.
- The ATMS software required for the operation of new controllers will coexist on the same network as the current County ATMS and provide functionality equal to or better than the current system.
- The selected corridor is expected to provide a good environment to validate that new controllers can be installed into existing cabinets without degrading current operation and, subsequently, evaluate new features and functions such as adaptive signal control.
- A modern traffic signal controller that is compatible with existing traffic cabinet architecture will allow relatively easy implementation and use of new capabilities, functions, and features.
- Migration to the Model 2070LX controller will allow the County to upgrade existing intersections to a modern, standards-based, higher-performance controller platform

without requiring replacement or significant rework of the County's existing controller cabinets.
- Newer controllers will be compliant with new industry standards and open standards for communication such as NTCIP.

Some of the limitations and disadvantages are:

- Users will need to make time for training and familiarizing themselves with the proposed system in addition to performing their current duties. This will likely introduce users to new operations and concepts.
- Requiring that staff learn and use a new ATMS software in order to evaluate a controller presents challenges, as does evaluating the features, functions, advantages, and disadvantages of different ATMS software in addition to the evaluation of the field controller
- Reuse of existing communications, detection, and signal controller cabinet hardware may impact a new controller's performance and limit functionalities of the ATMS.
- New controllers installed into existing cabinets may degrade current operation and subsequently not support the use of new features and functions such as adaptive signal control.
- The County TSS Division operates and maintains over 2,900 signalized intersections on state, county, and local roads within the County's geographical boundaries. With a project sample of 14 intersections (less than one percent of the total intersections), a complete assessment on the existing infrastructure is needed before any deployment, as existing cabinet conditions varies throughout the County, making some intersections more suitable for a seamless transition to new controllers than others.

9 Notes

There are no notes at this time. This section may be revised at a later date with additional information that will aid in understanding this ConOps.

10 Glossary

There are no additional definitions required at this time. This section may be revised at a later date with additional information that will aid in understanding this ConOps.

Miami-Dade County Caltrans 2070LX Traffic Signal Controller Deployment Project

Project Systems Engineering Management Plan

Technical Memorandum

November 10, 2016
Version 2.0

Prepared for:
Miami-Dade County
Department of Transportation and Public Works

Prepared by:

ATKINS

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Table of Contents

List of Figures

Acronym and Abbreviation List

AASHTO	American Association of State Highway and Transportation Official
ATC	Advanced Transportation Controller
ATMS	Advanced Traffic Management System
Caltrans	California Department of Transportation
CFP	Cost Feasible Plan
ConOps	Concept of Operations
DTPW	Miami-Dade County Department of Transportation and Public Works
FDOT	Florida Department of Transportation
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System
NEMA	National Electrical Manufacturers Association
NTCIP	National Transportation Communications for ITS Protocol
O&M	Operations and Maintenance
PSEMP	Project Systems Engineering Management Plan
RITSA	Regional ITS Architecture
RTVM	Requirements Traceability Verification Matrix

1 DOCUMENT OVERVIEW

This document is the Project Systems Engineering Management Plan (PSEMP) for the Miami-Dade County Department of Transportation and Public Works (DTPW) California Department of Transportation (Caltrans) Model 2070LX Traffic Signal Controller Deployment Project. A PSEMP is a plan that helps manage and control a project utilizing systems engineering processes. The PSEMP identifies what items are to be developed, delivered, integrated, installed, verified, and supported.

The document is organized as follows:

- Section 1 – Document Overview
- Section 2 – Need for a PSEMP
- Section 3 – Purpose and Scope
- Section 4 – Technical Project Summary Schedule
- Section 5 – Relationship to Other Plans
- Section 6 – Applicable Documents
- Section 7 – Systems Engineering Processes
- Section 8 – Project Management and Control

2 NEED FOR A PROJECT SYSTEMS ENGINEERING MANAGEMENT PLAN

The Federal Highway Administration's Title 23 Code of Federal Regulations, Part 940, requires states that desire federal assistance in deploying intelligent transportation systems (ITS) to use a systems engineering process to quality for financial assistance.[1] Accordingly, the Florida Department of Transportation (FDOT) implemented this requirement in its procedure for systems engineering.[2] The PSEMP documents how systems engineering will be used for ITS project management.

Florida's Statewide Systems Engineering Management Plan is used as a reference guide in the creation of this PSEMP.

2.1 Project Identification

Project Name: Miami-Dade County DTPW Caltrans 2070LX Traffic Signal Controller Deployment Project

[1] Title 23 Code of Federal Regulations, Part 940 – Intelligent Transportation System Architecture and Standards (January 2001). Available online at http://www.ops.fhwa.dot.gov/its_arch_imp/index.htm

[2] FDOT procedure titled Implementation of Rule 940 in Florida (Topic No 750-040-003). Available online at http://www.dot.state.fl.us/proceduraldocuments/procedures.shtm.

Project Description:

Phased countywide deployment of Caltrans Model 2070LX Traffic Signal Controllers and upgrade of existing Advanced Traffic Management System (ATMS) to a National Transportation Communications for ITS Protocol (NTCIP) compliant ATMS.

3 PURPOSE AND SCOPE

This document serves as the PSEMP for the project identified in section 2.1. It provides planning guidance for the technical management, procurement, installation, and acceptance of the project, which includes engineering and planning work needed to support the countywide deployment of the Caltrans 2070LX unit version traffic signal controllers. Work includes migrating from the Model D170E traffic controller and Kimley-Horn Integrated Transportation System to the Caltrans Model 2070LX traffic controller and upgrading the existing ATMS to a NTCIP-compliant ATMS.

Further details of the project can be obtained by reviewing other documents, such as the project concept of operations (ConOps), quality assurance plan, operations and maintenance (O&M) plan, and documentation developed during the implementation of the Caltrans 2070LX Deployment and Evaluation Project along NW 36th Street.

4 TECHNICAL PROJECT SUMMARY SCHEDULE

Upon successful Miami-Dade County evaluation of the 2070LX controller platform, the DTPW plans to migrate their legacy D170E controllers countywide to the new NTCIP-compliant controller platform over a period of approximately five years. This project will be constructed in multiple phases starting with the deployment of controllers along some or all of the congestion management corridors identified in Figure 4-1. This Section will be updated during the course of the project.

- Advertisement..... <<Month Year>>
- Letting / Notice to Proceed..... <<Month Year>>
- Construction..... <<Month Year>>to <<Month Year>>
- Fiber / Conduit Install..... <<Month Year>> to <<Month Year>>
- Central System Upgrade..... <<Month Year>> to <<Month Year>>
- Controller Field Deployment..... <<Month Year>> to <<Month Year>>
- Unit / Subsystem Tests..... <<Month Year>> to <<Month Year>>
- System Acceptance Tests..... <<Month Year>> to <<Month Year>>

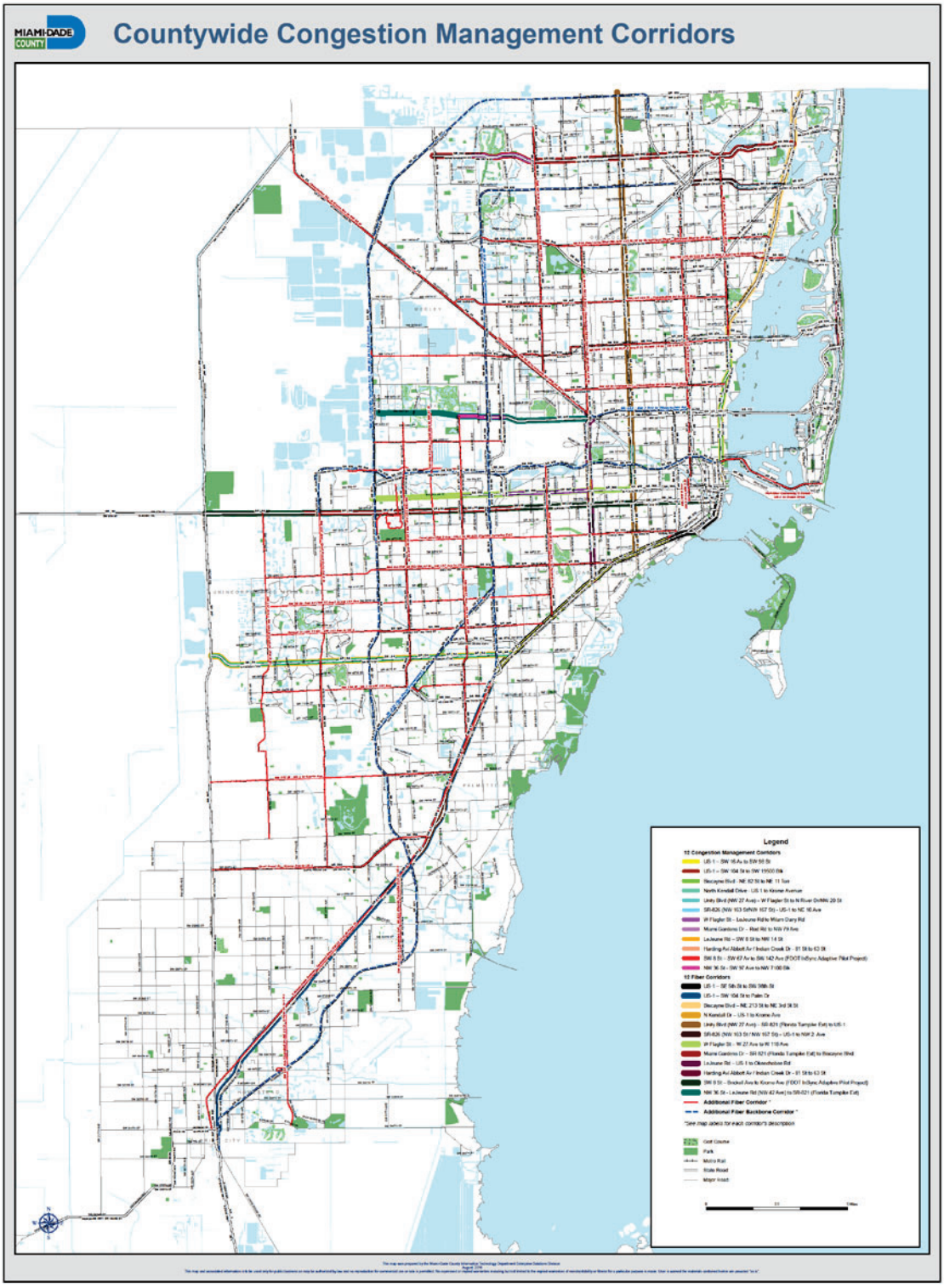

Figure 4.1 – Congestion Management Corridors

5 RELATIONSHIP TO OTHER PLANS

Future Miami-Dade County migration plans will be coordinated with FDOT District 6 and executed in concert with the FDOT ITS Strategic Plan.[3] The DTPW will coordinate with FDOT, which is also involved in the deployment of controllers on state roads in Miami-Dade County, including a current FDOT deployment involving adaptive signal control technology at SR 90 / US 41 / SW 8 Street. The DTPW will also coordinate with FDOT in order to meet the federal and state ITS requirements.

5.1 Florida's Ten-Year ITS Cost Feasible Plan

FDOT's *Ten-Year ITS Cost Feasible Plan* (*CFP*) is a resource plan that identifies ITS projects in the overall context of FDOT's ITS Corridor Implementation Plans. It represents a commitment of state- and District-managed ITS funds to provide a coordinated statewide plan to develop ITS infrastructure throughout Florida. This project is not directly funded by the *CFP*, but supports statewide efforts to deploy integrated and interoperable systems.

5.2 Florida's Statewide ITS Architecture

This project is included in the FDOT Districts 4 and 6 Regional ITS Architecture (RITSA) as the "Miami-Dade Traffic Controller Upgrade" and the "Miami-Dade County ATMS NTCIP Upgrade" projects, which have been documented as part of the Statewide ITS Architecture.

5.3 Other "On-project" Plans

FDOT ITS Strategic Plan:

The FDOT ITS Strategic Plan is a statewide ITS plan that outlines various elements of ITS and addresses four primary goals:

- Safe transportation for residents, visitors, and commerce;
- Protection of the public's investment in transportation;
- A statewide, interconnected transportation system that enhances Florida's economic competitiveness; and
- Travel choices to ensure mobility, sustain the quality of the environment, preserve community values, and reduce energy consumption.

Traffic Signal Maintenance and Compensation Agreement:

The "Traffic Signal Maintenance and Compensation Agreement" established between FDOT District 6 and Miami-Dade County is the governing document outlining the roles and responsibilities of each entity as it pertains to signalized intersections. This agreement includes all definitions of responsibilities as they pertain to all, "…traffic signals, traffic signal systems (central computer, cameras, message signs, and communications interconnect), school zone traffic control

3 Available on line at http://www.dot.state.fl.us/trafficoperations/its/Projects_Deploy/Strategic_Plan/ITS_Strategic_Plan_FINAL_v2_2014.pdf

devices, intersection flashing beacons, illuminated street name signs, and the payment of electricity and electrical charges incurred in connection with operation of such traffic signals and signal systems…"

Other Documents

The development of the project and PSEMP also required the development of the project's ConOps, Requirements Traceability Verification Matrix (quality assurance/testing), and O&M Plans. These documents are designed to complement the contents of this PSEMP and detail the finite elements required of each document. The ConOps has been complete. The Requirements Traceability Verification Matrix (testing) and O&M Plans are under development and will be utilized towards the end of each major phase of the project and after operations have been in place. Other documents include the Specifications developed thorugh the Caltrans 2070LX Deployment and Evaluation Project along NW 36th Street.

6 APPLICABLE DOCUMENTS

The following documents, of the exact issue shown, form a part of this document to the extent specified herein. In the event of a conflict between the contents of the documents referenced herein and the contents of this document, this document shall be considered the superseding document.

Florida Statewide and Regional ITS Architectures	**Florida's Statewide and Regional ITS Architectures chart the current and future course of ITS deployment. They govern the planning, design, development, integration, implementation, and O&M of Florida's ITS projects. Statewide and Regional ITS Architectures represent a shared vision of how systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travellers in the State of Florida.**
ATC 5201 v06.24: Advanced Transportation Controller (ATC) Standard Version 06	**Developed and maintained under the direction of the ATC Joint Committee, which is made up of representatives from** the **American Association of State Highway and Transportation Official (AASHTO), Institute of Transportation Engineers (ITE), and National Electrical Manufacturers Association (NEMA); defines a minimum required functionality of hardware and software for ATC-conforming transportation controllers.**

NTCIP 1202: Object Definitions for Actuated Traffic Signal Controller Units V02.19	**Developed to be a Joint AASHTO/ ITE/ NEMA Standards Publication; describes the objects used for managing actuated traffic signal controller units.**
FDOT Standard Specifications for Road and Bridge Construction	**Contains requirements for work, materials, and labor for all FDOT contracts.**
Caltrans Transportation Electrical Equipment Specifications, 2009 and Errata	**Developed and maintained by Caltrans; specifies among other things the requirements of the Model 170 and 2070 controllers including the Model 2070LX, supporting hardware, and compatible traffic controller cabinets.**
Traffic Control Equipment Specifications and Standards for Metro Traffic Control System, Miami-Dade County	**Requirements developed by Miami-Dade County for work, materials, and labor associated with the Miami-Dade traffic control system.**

7 SYSTEMS ENGINEERING PROCESSES

Key systems engineering processes that will be use for the project include:

- Identification of project in RITSA
- Collection and documentation of user needs
- Creation of ConOps
- Creation of high-level and detailed requirements
- Technical reviews
- Creation of the requirements traceability verification matrix (RTVM)
- System testing, integration and acceptance

7.1 Intelligent Transportation System Architecture

The project is identified in the RITSA. The market packages that have been selected from RITSA to develop the Project Intelligent Transportation System Architectute include:

- ATMS03-03_D46 – Traffic Signal Control

7.2 User Needs, ConOps, and Requirements Development

Detailed specifications, technical reports, and technical special provisions will be created as a result of outcomes from the initial evaluation deployment of 2070LX controllers along the 36th Street corridor and used as a basis for future deployment phases.

Future Miami-Dade County migration plans will be coordinated with FDOT District 6 and executed in concert with the FDOT ITS Strategic Plan. The DTPW will also coordinate with FDOT in order to meet federal and state ITS requirements.

This project includes identification of key stakeholders, solicitation of user needs, and documenting requirements. User needs have been captured and the high-level functional requirements have been developed for this project and are contained in the ConOps.

7.3 Technical Reviews

Technical reviews are required to properly accomplish work items completed for the project. FDOT District 6 and Miami-Dade County, in collaboration with all project stakeholders, should participate in the review process. Reviews that are conducted as part of this project should include but not be limited to:

- Project Kick-off
- ConOps Review
- Operational Readiness Review – conducted prior to full-scale deployment and operation to address all elements that need to be completed
- System Requirements Review
- Preliminary Design Review
- Hardware Design Review
- Software Design Review
- Requirement Traceability Verification Matrix
- Final Design Review – conducted to provide the final review of the system design
- Test Readiness Review – conducted prior to formal acceptance testing of the system
- Hot Wash-Up Review – conducted immediately after formal acceptance testing to obtain consensus on testing results and resolve major discrepancies

7.4 Identifying, Assessing, and Mitigating Risk

The following is an assessment of the risks that could affect the successful completion of the project on schedule,

- The traffic controllers chosen for this project will need to be compatible with field components that are currently in use within the County's traffic control system. A project goal is to reuse as much of the existing intersection hardware and equipment as possible. This project will use a Miami-Dade County approved Caltrans 2070LX controller that is largely compatible with the existing DTPW infrastructure, so there is a low risk of incompatibility with existing cabinets.
- Reuse of existing communications, detection, and signal controller cabinet hardware may impact a new controller's performance and limit functionalities of the ATMS
- New controllers installed into existing cabinets may degrade current operation and subsequently not support the use of new features and functions such as adaptive signal control.

7.5 Requirements Traceability Verification Matrix

A high-level RTVM is being developed for this project based upon user needs gathered from stakeholders and identified project requirements. The RTVM will be incorporated as an appendix to this document as it is developed and populated with requirements from the ConOps, User Needs Report, and other project documents developed during the life of this project.

7.6 Performance Measures

Controller and central software performance will be validated using test procedures developed to ensure that user needs and requirements are satisfied. All project requirements will meet or exceed applicable national and state requirements.

7.7 Conducting System Testing, Integration, Verification, Validation, and Acceptance Planning

The controller manufacturer deploying equipment for evaluation will work closely with the DTPW to conduct acceptance testing for controller and central software. A controller test procedure has been developed to help the DTPW bench test and prepare new controllers prior to installation. Refer to Test Procedure documents for additional details.

8 PROJECT MANAGEMENT AND CONTROL

The project will be conducted through a series of steps following systems engineering processes. Figure 8.1 provides an overview of the steps anticipated during this project.

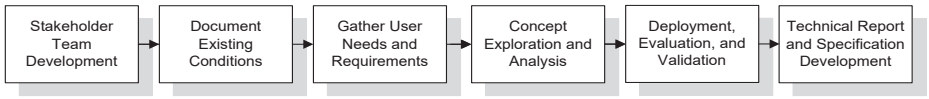

Figure 8.1 – Systems Engineering Steps

Figure 8.2 shows typical stages for an ITS project. The project manager's responsibility generally starts with project kick off and ends with O&M. There will be various people and organizations that help throughout this process. Consultants often perform duties including, but not limited to, systems engineering document preparation and high-level requirements analysis for development of minimum technical requirements, technical special provisions, and other project documents. The DTPW will be responsible for procurement processes as well as selection and award of contracts to deploy systems. A contractor typically performs construction and equipment installation activities, which are supervised by staff on behalf of the project manager. System acceptance is supervised and witnessed by an independent verification and validation team designated by the agency. Once accepted, the local maintaining agency will take responsibility for the system.

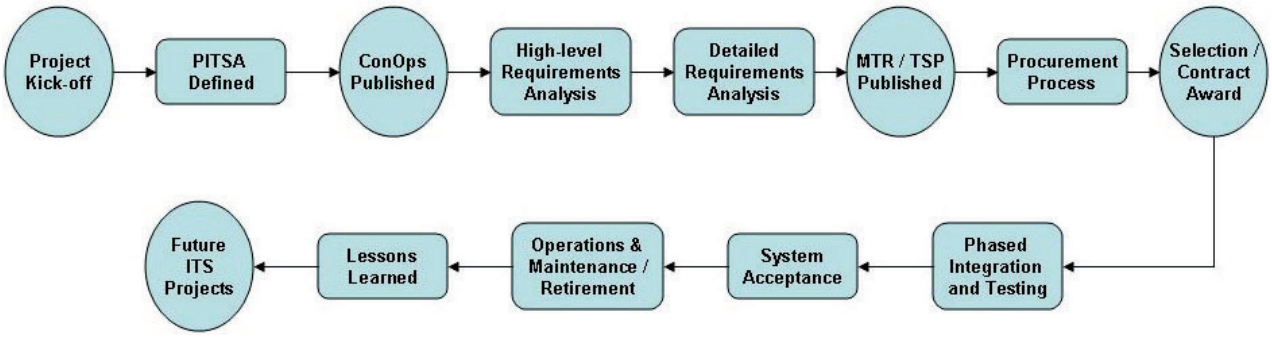

Figure 8.2 – ITS Project Stages

The following areas will be covered in this section:

- Organization structure
- Managing the schedule with a project evaluation and review technique chart, and the critical path method
- Procurement management
- Monthly project status reviews
- Quality management
- Systems acceptance
- O&M, upgrade, and retirement

8.1 Organization Structure

The Traffic Signals and Signs Division and the Information Technology Department are jointly managing the project to ensure that both traffic engineering needs and principals along with technology and communication requirements are met.

8.2 Managing the Schedule with the Project Evaluation and Review Technique and the Critical Path Method

Refer to the current Master Schedule for milestones and critical path information.

8.3 Procurement Management

The procurement of systems, products, and services for this project will be performed in accordance with County policies and procedures.

For future phases, DTPW plans to utilize a request for proposal procurement method in which the selected contractor shall provide items to comply with the specifications being developed as part of the separate Caltrans 2070LX Deployment and Evaluation Project.

8.4 Monthly Project Status Reviews

All meetings are provided with agenda items and meeting minutes. See project meeting documents for additional information.

8.5 Quality Management

All deliverables produced by Atkins for this project will be in accordance with the Atkins Quality and Technical Assurance Manual. In addition, Atkins has implemented a SharePoint document storage and review repository for document development and review related to this project. All deliverables have an in-depth internal review. Once a document has satisfactorily passed internal development, it is placed on an external SharePoint site for the County to review and contribute. After the document needs are met and all comments are addressed, Atkins prepares clean versions of 60 and 90 percent, and final documents for archival and transmittal. It is important to note that many of the documents generated for this project can be considered “living documents” and may change even after they are considered final.

8.6 System Acceptance

Econolite has provided documented acceptance test procedures and guidance for the central software that they have delivered and installed for the Caltrans 2070LX Evaluation and Deployment Project. Atkins has provided a vendor-neutral controller test procedure that documents the steps taken by Miami-Dade County technical staff to inspect and prepare a controller prior to deployment in the field.

Future system acceptance test documentation is being developed for the DTPW as part of this project.

8.7 Operations and Maintenance, Upgrade, and Retirement

An O&M plan for the countywide deployment will be prepared for review and approval by DTPW. The O&M plan will include the policies and procedures that will be utilized to address: all scheduled and unscheduled maintenance reponses for all hardware and software; communications links and network; and traffic signal controller upgrades including the retirement of the D170 signal controller.

Exhibit 12

FDOT District Six - Adaptive Signal Control Technologies (ASCT)

Florida Department of Transportation

District Six

Adaptive Signal Control Technologies (ASCT)

System Requirements

July 27, 2016

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Document Description

Client	Florida Department of Transportation District 6/ Miami-Dade County
Project Name	FDOT District 6 ASCT
Related Task Number	FPN 435506-1-92-01
Document Name	System Requirements
Date Document Issued	July 27, 2016

Version Control

Version Number	Date	Description of Change	Author
1	7/27/16	Final Draft	ACM/MKC

Table of Contents

1.0 SCOPE

1.1 DOCUMENT PURPOSE AND SCOPE

The scope of this document covers the consideration of Adaptive Signal Control Technology (ASCT) use within the Miami-Dade County (MDC) region as part of the Active Arterial Management (AAM) initiative under the Florida Department of Transportation (FDOT) District Six Transportation Systems Management and Operations (TSM&O) Program. The region is shown in Figure 1 of the Concept of Operations. This System Engineering Analysis (SEA) will provide the basis for the use of ASCT as a feasible TSM&O strategy for active arterial management within the District.

This document describes and provides a rationale for the regional system requirements of the proposed adaptive system. It also documents the outcome of stakeholder discussions and consensus building that has been undertaken to ensure that the system that is implemented is operationally feasible and has the support of the stakeholders as identified in the Florida District Four/District Six Southeast Regional ITS Architecture, and through identification of other stakeholders from FDOT and Miami-Dade County.

Following the concept of operation, with agreement among stakeholders about the needs, the operating concepts, the operational environment and support environment, this document shall provide the detailed system requirements of an ASCT within the MDC region.

1.2 PROJECT PURPOSE AND SCOPE

The main purpose of this project is to define all of the stakeholder's needs and objectives to qualify the use of adaptive traffic signal control within MDC region. This effort is unique in two ways. The first is that the effort includes the countywide regional plan for the deployment of adaptive systems as well as a stand-alone pilot project that has the goal of testing the effectiveness of one of the adaptive signal control technologies. The second is the sheer number of signals within the region's signal system and the number of stakeholders involved throughout the region. This effort will define the needs of the countywide system and document the system requirements. The later design portion of each project will define the adaptive traffic signal system that satisfies the documented system requirements and the stakeholder's needs and constraints through technical special provisions and all necessary design plans and documents as required by the Florida Department of Transportation (FDOT) District Six, Miami-Dade County, and the Federal Highway Administration (FHWA).

The ASCT initiative involves the application of ASCT initially to SR 90/US 41/SW 8th Street study corridor and the regional application of ASCT throughout the Miami-Dade region. To the extent that it appears feasible, consideration will also be given to application of ASCT to other future corridors within the operating and maintaining jurisdictions, as residential and commercial developments grow within the project area. The project regional location is shown in Figure 1 of the Concept of Operations.

The objectives identified for the pilot study are consistent with those identified by MDC and FDOT D6 for the regional approach. These objectives include the following:

- Smooth the flow of through traffic by improving the systems performance;
- Improve upon or at a minimum maintain the performance for major and minor street movements;
- Increase system throughput;
- Improve travel time reliability;
- Improve safety;
- Accommodate and provide mobility for special users and conditions;
- Reduce negative impacts to the environment; and
- Maintain the effectiveness of MDC operations.

An adaptive traffic signal system allows for some or all of the signal timing parameters to be modified in response to changes in traffic conditions in a real time setting. This allows the system to accommodate irregular traffic patterns that are created by existing commuter and commercial traffic thus providing smoother flow along a corridor. It additionally is enabled to accommodate the need for constantly changing signal timings for new developments within the area as well as disruptions to the system from incidents, railroad crossing pre-emptions, and irregular traffic patterns introduced by interstates or other large generators. This project will review the needs for adding adaptive capabilities to the functionality of the existing coordinated signal system and require that existing capabilities be maintained. The adaptive system will have the capability of working independently or with existing traffic signal systems and time-of-day (TOD) plans that may be in place. The adaptive system will be integrated with the existing traffic signal system, yet will have the ability to be manually turned off to allow for the existing system to resume control as needed. Furthermore, fallback and failure modes will be defined in subsequent sections.

2.0 REFERENCED DOCUMENTS

The following documents have been referenced or used to guide the preparation of this concept of operation.

2.1 PLANNING DOCUMENTS

- Southeast Florida Regional Transportation Plan 2035: http://seftc.org/system/uploads/documents/Southeast%20Florida%20Regional%20Transportation%20Plan_FINAL.pdf?1285195617
- Miami-Dade 2040 Long Range Transportation Plan: http://www.miamidade2040lrtp.com/wp-content/uploads/2040_LRTP_Plan.pdf
- Miami-Dade Transportation Improvement Program (TIP) Fiscal Years 2014/2015 to 2018/2019: http://www.interactip.com/Draft2015TIP.html
- Unified Planning Work Program: http://miamidadempo.org/library/reports/upwp/2015-2016-unified-planning-work-program-2014-06.pdf
- Five Year Implementation Plan of the Peoples Transportation Plan (PTP): http://www.miamidade.gov/citt/library/five-year-plan/2014/five-year-plan.pdf

2.2 ADAPTIVE SIGNALS

- NCHRP Synthesis 403: “Adaptive Traffic Control Systems: Domestic and Foreign State of Practice”: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_403.pdf

2.3 ITS, OPERATIONS, ARCHITECTURE , OTHERS

- FHWA Rule 940, Federal Register / Vol. 66, No. 5 / Monday, January 8, 2001 / Rules and Regulations, DEPARTMENT OF TRANSPORTATION, Federal Highway Administration 23 CFR Parts 655 and 940, (FHWA Docket No. FHWA-99-5899) RIN 2125-AE65 Intelligent Transportation System Architecture and Standards
- Regional ITS Architecture Guidance Document, “Developing, Using, and Maintaining an ITS Architecture for your Region; National ITS Architecture Team; October, 2001
- Florida District 4/District 6 Regional Intelligent Transportation System Architecture: http://www.consystec.com/florida/d46/web/_regionhome.htm
- NTCIP 1211 version v02. “Signal Control and Prioritization (SCP).”
- NEMA TS1
- NEMA TS2

2.4 SYSTEM ENGINEERING

- FHWA. (2012, August). Model Systems Engineering Documents for Adaptive Signal Control Technology (ASCT) Systems - Final Guidance Document. U.S.

Department of Transportation: http://ops.fhwa.dot.gov/publications/fhwahop11027/mse_asct.pdf

- FHWA. (2007, January). Systems Engineering for Intelligent Transportation Systems - An Introduction for Transportation Professionals. U.S. Department of Transportation: http://www.ops.fhwa.dot.gov/publications/seitsguide/seguide.pdf
- FHWA Systems Engineering Guidebook Version 3.0: http://www.fhwa.dot.gov/cadiv/segb/
- FHWA. (2013, July). Measures of Effectiveness and Validation Guidance for Adaptive Signal Control Technologies: http://www.ops.fhwa.dot.gov/publications/fhwahop13031/index.htm

2.5 PROCUREMENT

- NCHRP 560 Guide to Contracting ITS Projects: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_560.pdf
- The Road to Successful ITS Software Acquisition: http://www.fhwa.dot.gov/publications/research/operations/its/98036/rdsuccessvol2.pdf

3.0 ASCT SYSTEM REQUIREMENTS

The System Requirements are derived from the objectives and needs of the Concept of Operations. These requirements describe what will be expected of the system. In order to understand the system requirements, the Needs Statements from the Concept of Operations are listed below:

3.1 NEEDS STATEMENTS LIST

User Needs Reference Number	Concept of Operations Sample Statements
4	**4: Operational Needs**
4.0-1	This chapter describes the operational needs of the users that should be satisfied by the proposed ASCT system. Each of these statements describes something that the system operators need to be able to achieve. Each of these needs will be satisfied by compliance with one or more system requirements. In the attached list of requirements, each one is linked to one or more of these needs statements.
4.1	**4.1 Adaptive Strategies**
4.1.0-1	The system operator needs the ability to implement different strategies individually or in combination to suit different prevailing traffic conditions. These strategies include:
4.1.0-1.0-1	· Maximize the throughput on coordinated routes
4.1.0-1.0-2	· Provide smooth flow along coordinated routes
4.1.0-1.0-3	· Distribute phase times in an equitable fashion
4.1.0-1.0-4	· Manage the lengths of queues
4.1.0-1.0-5	· Manage the locations of queues within the network
4.1.0-1.0-6	· At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
4.1.0-2	The system operator needs to manage the coordination in small groups of signals to link phase service at some intersections with phase service at adjacent intersections.
4.1.0-3	The system operator needs to change the operational strategy (for example, from smooth flow to maximizing throughput or managing queues) based on changing traffic conditions.
4.1.0-4	The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5.
4.1.0-5	The system operator needs to minimize the chance that a queue forms at a specified location.

User Needs Reference Number	Concept of Operations Sample Statements
4.1.0-6	The system operator needs to modify the sequence of phases to support the various operational strategies.
4.1.0-7	The system operator needs to fix the sequence of phases at any specified location. For example, the operator may need to fix the phase order at a diamond interchange.
4.1.0-8	The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.
4.1.0-9	The system operator needs to set signal timing parameters (such as minimum green, maximum green and extension time) to comply with agency policies.
4.2	**4.2 Network characteristics**
4.2.0-1	The system operator needs to eventually adaptively control up to 3000 signals.
4.2.0-2	The system operator needs to be able to adaptively control up to 400 independent groups of signals
4.2.0-3	The system operator needs to vary the number of signals in an adaptively controlled group to accommodate the prevailing traffic conditions.
4.3	**4.3 Coordination across boundaries**
4.3.0-1	The system operator needs to adaptively control signals operated by various jurisdictions within the FDOT District 6. Operational jurisdictions or agencies will be specified by each specific ASCT project.
4.3.0-3	The system operator needs to adaptively coordinate signals on two crossing routes simultaneously.
4.3.0-5	The system operator needs to constrain the adaptive system to operate a cycle length compatible with the crossing arterial.
4.3.0-6	The system operator needs to detect traffic approaching from a neighboring system and coordinate the ASCT operation with the adjacent system.
4.4	**4.4 Security**
4.4.0-1	The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
4.5	**4.5 Queuing interactions**
4.5.0-1	The system operator needs to detect queues from outside the system and modify the ASCT operation to accommodate the queuing.
4.5.0-2	The system operator needs to detect queues within the system's boundaries and modify the ASCT operation to accommodate the queuing.
4.5.0-3	The system operator needs to detect queues propagating outside its boundaries from within the ASCT boundaries, and modify its operation to accommodate the queuing.

User Needs Reference Number	Concept of Operations Sample Statements
4.5.0-4	The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation.
4.5.0-5	The system operator needs to prevent queues forming at user-specified locations.
4.6	**4.6 Pedestrians**
4.6.0-2	The system operator needs to accommodate infrequent pedestrian operation while maintaining adaptive operation. (This is appropriate for pedestrian calls that are common but not so frequent that they drive the operational needs.)
4.6.0-3	The system operator needs to incorporate frequent pedestrian operation into routine adaptive operation. (This is appropriate when pedestrians are frequent enough that they must be assumed to be present every cycle or nearly every cycle.)
4.6.0-4	The system operator needs to accommodate the following custom pedestrian features: early walk, mid-block crossings, and exclusive pedestrian phases.
4.6.0-5	The system operator needs to accommodate early start of walk and exclusive pedestrian phases.
4.7	**4.7 Non-adaptive situations**
4.7.0-1	The system operator needs to detect traffic conditions during which adaptive control is not the preferred operation, and implement some pre-defined operation while that condition is present.
4.7.0-2	The system operator needs to schedule pre-determined operation by time of day.
4.7.0-3	The system operator needs to over-ride adaptive operation.
4.8	**4.8 System responsiveness**
4.8.0-1	The system operator needs to modify the ASCT operation to closely follow changes in traffic conditions.
4.8.0-2	The system operator needs to constrain the selection of cycle lengths to those that provide acceptable operations, such as when resonant progression solutions are desired.
4.9	**4.9 Complex coordination and controller features**
4.9.0-1	The system operator needs to implement the following advanced controller features while maintaining adaptive operation:
4.9.0-1.0-1	· Service a phase more than once per cycle
4.9.0-1.0-2	· Operate at least 8 overlap phases
4.9.0-1.0-3	· Operate a minimum of four rings, 16 phases and up to four phases per ring
4.9.0-1.0-4	· Permit different phase sequences under different traffic conditions
4.9.0-1.0-5	· Allow one or more phases to be omitted (disabled) under certain traffic conditions or signal states.
4.9.0-1.0-6	· Prevent one or more phases from being skipped under certain traffic conditions or signal states.

User Needs Reference Number	Concept of Operations Sample Statements
4.9.0-1.0-7	· Allow detector logic at an intersection to be varied depending on local signal states
4.9.0-1.0-8	· Accommodate the following custom features used by this agency: a. Need to adjust adaptive operation should manual operation be put into effect (police).
4.9.0-1.0-9	· Allow any phase to be designated as the coordinated phase
4.9.0-1.0-10	· Allow the operator to specify which phase receives unused time from a preceding phase
4.9.0-1.0-11	· Allow the controller to respond independently to individual lanes of an approach. This may be implemented in the signal controller using extension/passage timers, which may be assignable to each vehicle detector input channel. This may allow the adaptive operation to be based on data from a specific detector, or by excluding specific detectors.
4.9.0-1.0-12	· Allow the coordinated phase to terminate early under prescribed traffic conditions
4.9.0-1.0-13	· Allow flexible timing of non-coordinated phases (such as late start of a phase) while maintaining coordination
4.9.0-1.0-14	· Protected/permissive phasing and alternate left turn phase sequences.
4.9.0-1.0-15	· Use flashing yellow arrow to control permissive left turns and right turns.
4.9.0-1.0-16	· Service side streets and pedestrian phases at minor locations more often than at adjacent signals when this can be done without compromising the quality of the coordination. (E.g., double-cycle mid-block pedestrian crossing signals.)
4.9.0-1.0-17	· Use negative pedestrian phasing to prevent an overlap conflicting with a pedestrian walk/don't walk
4.10	**4.10 Monitoring and control**
4.10.0-1	The system operator needs to monitor and control all required features of adaptive operation from the following locations:
4.10.0-1.0-1	· Various FDOT District 6 Jurisdictional TMCs. These will be defined by project
4.10.0-1.0-2	· Maintenance facility
4.10.0-1.0-3	· Workstations on the Operating Agency's LAN or WAN located at Jurisdictional TMCs
4.10.0-1.0-7	· Remote locations via VPN
4.10.0-2	The operator needs to access to the database management, monitoring and reporting features and functions of the signal controllers and any related signal management system from the access points defined for those system components.
4.11	**4.11 Performance reporting**
4.11.0-1	The agency needs the ATMS/signal software to be able to monitor the ASCT operation.
4.11.0-2	The system operator needs to store and report data used to calculate signal timing and have the data available for subsequent analysis.

User Needs Reference Number	Concept of Operations Sample Statements
4.11.0-3	The system operator needs to store and report data that can be used to measure traffic performance under adaptive control.
4.11.0-4	The system operator needs to store all operational data and signal timing parameters calculated by the adaptive system, and export selected data to current software utilized by the Operating Agency
4.11.0-6	The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.
4.11.0-7	Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.
4.12	**4.12 Failure notification**
4.12.0-1	The system operator needs to immediately notify maintenance and operations staff of alarms and alerts.
4.12.0-2	The system operator needs to immediately and automatically pass alarms and alerts to the operating agency's user defined email and phone/text system.
4.12.0-3	The system operator needs to maintain a complete log of alarms and failure events.
4.13	**4.13 Preemption and priority**
4.13.0-1	The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations.
4.13.0-2	The system operator needs to accommodate emergency vehicle preemption along pre-defined routes.
4.13.0-3	The system operator needs to accommodate bus and light rail transit signal priority
4.13.0-4	The system operator needs to accommodate [future] light rail priority. Those needs will be defined after system has been chosen. ASCT needs to list all applicable Light Rail systems and interfaces
4.14	**4.14 Failure and fallback**
4.14.0-1	The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
4.15	**4.15 Constraints**
4.15.0-1	The system operator is constrained to use the following equipment:
4.15.0-1.0-1	· Controller type (TBD)
4.15.0-1.0-2	· Detector type (video detection, inductive loops, Other detection may be introduced in the future)
4.15.0-1.0-3	· Communication system (IP/Ethernet)

User Needs Reference Number	Concept of Operations Sample Statements
4.15.0-1.0-4	· Cabinet type and size (Currently MD 552A, MD552X, MD 660A, MD660X. MDC is also deploying TS2 cabinets and reviewing future signal cabinet requirements)
4.15.0-1.0-5	· Signal management system (Currently KITS. MDC is currently analyzing the need for additional/new signal management software.)
4.15.0-2	The system operator needs to use equipment and software acceptable under current agency IT policies and procedures.
4.15.0-3	Not used
4.15.0-4	Not used
4.16	**4.16 Training and support**
4.16.0-1	The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
4.16.0-2	The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agencies therefore needs the system to be maintained to repair faults that are not defects in materials and workmanship.
4.16.0-3	The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agency therefore needs the system to remain free of defects in materials and workmanship that result in requirements no longer being fulfilled.
4.16.0-4	The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agency therefore needs support to keep software and software environment updated as necessary to prevent requirements no longer being fulfilled.
4.17	**4.17 External interfaces**
4.17.0-1	The system operator needs to be able to turn on signs that control traffic or provide driver information when specific traffic conditions occur, when needed to support the adaptive operation, when congestion is detected at critical locations or according to a time-of-day schedule
4.18	**4.18 Maintenance**
4.18.0-1	Each Operating Agency needs all applicable equipment to be readily accessible.

3.2 SYSTEM REQUIREMENTS LIST

The System requirements are listed as follows. The adaptive signal control software shall meet the requirements listed herein. The software provider will be required to verify that they meet these requirements, or list what more may be required for their system to meet the requirements, as discussed in the Verification Plan.

Requirements Reference Number	System Requirements
1	1 Network Characteristics
1.0-1	The ASCT shall control a minimum of 3000 signals concurrently
1.0-2	The ASCT shall support groups of signals.
1.0-2.0-1	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be defined by the user.
1.0-2.0-2	The ASCT shall control a minimum of 400 groups of signals.
1.0-2.0-3	The size of a group shall range from 1 to 100 signals.
1.0-2.0-4	Each group shall operate independently
1.0-2.0-5	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the ASCT system according to configured parameters.
1.0-2.0-5.0-1	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to a time of day schedule. (For example: this may be achieved by assigning signals to different groups or by combining groups.)
1.0-2.0-5.0-2	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to traffic conditions. (For example: this may be achieved by assigning signals to different groups or by combining groups.)
1.0-2.0-5.0-3	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system when commanded by the user.
2	2 Type of Operation
2.1	2.1 General
2.1.1	2.1.1 Mode of Operation
2.1.1.0-1	The ASCT shall operate non-adaptively during the presence of a defined condition.
2.1.1.0-2	The ASCT shall operate non-adaptively when adaptive control equipment fails.
2.1.1.0-2.0-1	The ASCT shall operate non-adaptively when a user-specified detector fails.
2.1.1.0-2.0-2	The ASCT shall operate non-adaptively when the number of failed detectors connected to a signal controller exceeds a user-defined value.
2.1.1.0-2.0-3	The ASCT shall operate non-adaptively when the number of failed detectors in a group exceeds a user-defined value.
2.1.1.0-2.0-4	The ASCT shall operate non-adaptively when a user-defined communications link fails.
2.1.1.0-3	The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptively controlling a group of signals.
2.1.1.0-4	The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptive operation.

Requirements Reference Number	System Requirements
2.1.1.0-5	The ASCT shall operate non-adaptively in accordance with a user-defined time-of-day schedule.
2.1.1.0-7	The ASCT shall alter the adaptive operation to achieve required objectives in user-specified conditions. (The required objectives are specified in Needs Statement 4.1.0-1. Responding to this requirement demonstrates how the proposed system allows the user to define the conditions at which the objectives shift and their associated requirements are fulfilled.) (The alteration may be made by adjusting parameters or by directly controlling the state of signal controllers.)
2.1.1.0-7.0-1	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of the signal controllers, maximizing the throughput of the coordinated route.
2.1.1.0-7.0-2	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers, preventing queues from exceeding the storage capacity at user-specified locations.
2.1.1.0-7.0-3	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers providing equitable distribution of green times.
2.1.1.0-7.0-4	When current measured traffic conditions meet user-defined criteria, the ASCT shall alter the state of signal controllers providing two-way progression on a coordinated route.
2.1.1.0-8	The ASCT shall provide maximum and minimum phase times.
2.1.1.0-8.0-1	The ASCT shall provide a user-specified maximum value for each phase at each signal controller.
2.1.1.0-8.0-1.0-1	The ASCT shall not provide a phase length longer that the maximum value.
2.1.1.0-8.0-2	The ASCT shall provide a user-specified minimum value for each phase at each signal controller.
2.1.1.0-8.0-2.0-1	The ASCT shall not provide a phase length shorter than the minimum value.
2.1.1.0-9	The ASCT shall detect repeated phases that do not serve all waiting vehicles. (These phase failures may be inferred, such as by detecting repeated max-out.)
2.1.1.0-9.0-1	The ASCT shall alter operations, to minimize repeated phase failures.
2.1.1.0-10	The ASCT shall determine the order of phases at a user-specified intersection. (The calculation will be based on the optimization function.)
2.1.1.0-11	The ASCT shall provide coordination along a route.
2.1.1.0-11.0-1	The ASCT shall coordinate along a user-defined route.
2.1.1.0-11.0-2	The ASCT shall determine the coordinated route based on traffic conditions.
2.1.1.0-11.0-3	The ASCT shall determine the coordinated route based on a user-defined schedule.

Requirements Reference Number	System Requirements
2.1.1.0-11.0-4.0-1	The ASCT shall implement a stored coordinated route by operator command.
2.1.1.0-11.0-4.0-2	The ASCT shall implement a stored coordinated route based on traffic conditions.
2.1.1.0-11.0-4.0-3	The ASCT shall implement a stored coordinated route based on a user-defined schedule.
2.1.1.0-12	The ASCT shall not prevent the use of phase timings in the local controller set by agency policy.
2.1.2	**2.1.2 Allowable Phases**
2.1.2.0-1	The ASCT shall not prevent protected/permissive left turn phase operation.
2.1.2.0-2	The ASCT shall not prevent the protected left turn phase to lead or lag the opposing through phase based upon user-specified conditions.
2.1.2.0-3	The ASCT shall prevent skipping a user-specified phase when the user-specified phase sequence is operating.
2.1.2.0-4	The ASCT shall prevent skipping a user-specified phase based on the state of a user-specified external input.
2.1.2.0-5	The ASCT shall prevent skipping a user-specified phase according to a time of day schedule.
2.1.2.0-6	The ASCT shall omit a user-specified phase when the cycle length is below a user-specified value.
2.1.2.0-7	The ASCT shall omit a user-specified phase based on measured traffic conditions.
2.1.2.0-8	The ASCT shall omit a user-specified phase based on the state of a user-specified external input.
2.1.2.0-9	The ASCT shall omit a user-specified phase according to a time of day schedule
2.1.2.0-10	The ASCT shall assign unused time from a preceding phase that terminates early to a user-specified phase as follows: · next phase; · next coordinated phase; · user-specified phase.
2.1.2.0-11	The ASCT shall assign unused time from a preceding phase that is skipped to a user-specified phase as follows: · previous phase; · next phase; · next coordinated phase; · user-specified phase.
2.1.2.0-12	The ASCT shall not alter the order of phases at a user-specified intersection.
2.1.3	**2.1.3 Oversaturation**

Requirements Reference Number	System Requirements
2.1.3.0-1	The ASCT shall detect the presence of queues at pre-configured locations.
2.1.3.0-2	When queues are detected at user-specified locations, the ASCT shall execute a user-specified timing plan/operational mode.
2.1.3.0-3	When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.
2.1.3.0-4	When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller.
2.1.3.0-5	The ASCT shall meter traffic into user-specified bottlenecks by storing queues at user-specified locations.
2.1.3.0-6	The ASCT shall store queues at user-specified locations.
2.1.3.0-7	The ASCT shall maintain capacity flow through user-specified bottlenecks.
2.1.3.0-8	When queues are detected at user-specified locations, the ASCT shall limit the cycle length of the group to a user-specified value.
2.2	**2.2 Sequence-based Adaptive Coordination**
2.2.0-2	(Sequence-based only) The ASCT shall select cycle length based on a time of day schedule.
2.2.0-3	(Sequence-based only) The ASCT shall calculate phase lengths for all phases at each signal controller to suit the current coordination strategy.
2.2.0-4	(Sequence-based only) The ASCT shall calculate offsets to suit the current coordination strategy for the user-specified reference point for each signal controller along a coordinated route within a group.
2.2.0-4.0-1	(Sequence-based only) The ASCT shall apply offsets for the user-specified reference point of each signal controller along a coordinated route.
2.2.0-5	(Sequence-based only) The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required elsewhere, e.g., progression, queue management, equitable distribution of green).
2.2.0-5.0-1	(Sequence-based only) The ASCT shall limit cycle lengths to user-specified values.
2.2.0-5.0-2	(Sequence-based only) The ASCT shall limit cycle lengths to a user-specified range.
2.2.0-5.0-3	(Sequence-based only) The ASCT shall calculate optimum cycle length according to the user-specified coordination strategy.
2.2.0-5.0-4	(Sequence-based only) The ASCT shall limit changes in cycle length to not exceed a user-specified value.
2.2.0-5.0-4.0-1	(Sequence-based only) The ASCT shall increase the limit for the following XX cycles based on a change in conditions.
2.2.0-5.0-4.0-1.0-1	(Sequence-based only) The change in conditions shall be defined by 5 successive adaptive increases in cycle length at the maximum rate.
2.2.0-5.0-4.0-1.0-2	(Sequence-based only) The increased limit shall be user-defined.

Requirements Reference Number	System Requirements
2.2.0-5.0-5	(Sequence-based only) The ASCT shall adjust offsets to minimize the chance of stopping vehicles approaching a signal that have been served by a user-specified phase at an upstream signal.
2.3	**2.3 Non-sequence-based adaptive coordination**
2.3.0-2	(Non-sequence-based only) The ASCT shall calculate the appropriate state of the signal to suit the current coordination strategy at the critical signal controller. (A critical signal controller is defined by the user.)
2.3.0-3	(Non-sequence-based only) At non-critical intersections within a group, the ASCT shall calculate the time at which a user-specified phase shall be green, relative to a reference point at the critical intersection, to suit the current coordination strategy.
2.3.0-4	(Non-sequence-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection.
2.3.0-5	(Non-sequence-based only) The ASCT shall adjust signal timing so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop.
2.4	**2.4 Single intersection adaptive operation**
2.4.0-2	The ASCT shall calculate a cycle length of a single intersection, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)
2.4.0-3	The ASCT shall calculate optimum phase lengths, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)
2.4.0-3.0-1	The ASCT shall limit the difference between the length of a given phase and the length of the same phase during its next service to a user-specified value.
2.4.0-3.0-2	When queues are detected at user-specified locations, the ASCT shall execute a user-specified timing plan/operational mode.
2.4.0-4	The ASCT shall calculate phase order, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)
2.5	**2.5 Phase-based adaptive coordination**
2.5.0-2	(Phase-based only) The ASCT shall alter the state of the signal controller for all phases at the user-specified intersection.
2.5.0-3	(Phase-based only) The ASCT shall calculate the time at which a user-specified phase shall be green at an intersection.
2.5.0-4	(Phase-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection.

Requirements Reference Number	System Requirements
2.5.0-5	(Phase-based only) The ASCT shall alter the operation of the non-critical intersections to minimize stopping of traffic released from user-specified phases at the user-specified critical intersection.
2.5.0-6	(Phase-based only) The ASCT shall alter the operation of the non-critical intersections to minimize stopping of traffic arriving at user-specified phases at the user-specified critical intersection.
2.5.0-7	(Phase-based only) The ASCT shall adjust the state of the signal controller so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop.
2.6	**2.6 Responsiveness**
2.6.0-1	The ASCT shall limit the change in consecutive cycle lengths to be less than a user-specified value.
2.6.0-2	The ASCT shall limit the change in phase times between consecutive cycles to be less than a user-specified value. (This does not apply to early gap-out or actuated phase skipping.)
2.6.0-3	The ASCT shall limit the changes in the direction of primary coordination to a user-specified frequency.
2.6.0-5	The ASCT shall select cycle length from a list of user-defined cycle lengths.
3	**3 External/Internal Interfaces**
3.0-1	The ASCT shall not alter the operation of existing external systems.
3.0-1.0-3	The ASCT shall not interfere with ATMS/signal software operation, data logging and monitoring
4	**4 Crossing Arterials and Boundaries**
4.0-1	The ASCT shall conform its operation to an external system's operation.
4.0-1.0-1	The ASCT shall alter its operation to minimize interruption of traffic entering the system. (This may be achieved via detection, with no direct connection to the other system.)
4.0-1.0-2	The ASCT shall operate a fixed cycle length to match the cycle length of an adjacent system.
4.0-1.0-4	The ASCT shall support adaptive coordination on crossing routes.
5	**5 Access and Security**
5.0-1	The ASCT shall be implemented with a security policy that addresses the following selected elements:
5.0-1.0-1	· Local access to the ASCT.
5.0-1.0-2	· Remote access to the ASCT.
5.0-1.0-3	· System monitoring.
5.0-1.0-4	· System manual override.

Requirements Reference Number	System Requirements
5.0-1.0-5	· Development
5.0-1.0-6	· Operations
5.0-1.0-7	· User login
5.0-1.0-8	· User password
5.0-1.0-9	· Administration of the system
5.0-1.0-10	· Signal controller group access
5.0-1.0-11	· Access to classes of equipment
5.0-1.0-12	· Access to equipment by jurisdiction
5.0-1.0-13	· Output activation
5.0-1.0-14	· System parameters
5.0-1.0-15	· Report generation
5.0-1.0-16	· Configuration
5.0-1.0-17	· Security alerts
5.0-1.0-18	· Security logging
5.0-1.0-19	· Security reporting
5.0-1.0-20	· Database
5.0-1.0-21	· Signal controller
5.0-2	The ASCT shall provide monitoring and control access at the following locations:
5.0-2.0-1	· Agency TMC
5.0-2.0-2	· Maintenance facility
5.0-2.0-3	· Operating Agency LAN or WAN
5.0-2.0-7	· Remote locations via Virtual Private Network access though cloud services (Internet)
5.0-3	The ASCT shall comply with the agency's security policy as described in ( ).
5.0-4	The ASCT shall not prevent access to the local signal controller database, monitoring or reporting functions by any installed signal management system.
6	**6 Data Log**
6.0-1	The ASCT shall log the following events:
6.0-1.0-1	Time-stamped vehicle phase calls
6.0-1.0-2	Time-stamped pedestrian phase calls
6.0-1.0-3	Time-stamped emergency vehicle preemption calls
6.0-1.0-4	Time-stamped transit priority calls
6.0-1.0-5	Time-stamped railroad preemption calls
6.0-1.0-6	Time-stamped start and end of each phase
6.0-1.0-7	Time-stamped controller interval changes
6.0-1.0-8	Time-stamped start and end of each transition to a new timing plan

Requirements Reference Number	System Requirements
6.0-2	The ASCT shall export its systems log in the following formats: · MS Excel · Text · CSV · Open source SQL database
6.0-3	The ASCT shall store the event log for a minimum of 30 days.
6.0-4	The ASCT shall store results of all signal timing parameter calculations for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data.
6.0-5	The ASCT shall store the following measured data in the form used as input to the adaptive algorithm for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data: · volume · occupancy · queue length · phase utilization · arrivals in green · green band efficiency The ASCT shall state other measurement data or variations of this list based on exact algorithm operations
6.0-6	The ASCT system shall archive all data automatically after a user-specified period not less than 30 days.
6.0-7	The ASCT shall provide data storage for a system size of 3000 signal controllers. The data to be stored shall include the following: · Controller state data · Reports · Log data · Security data · ASCT parameters · Detector status data
6.0-8	The ASCT shall calculate and report relative data quality including: · The extent data is affected by detector faults · Other applicable items

Requirements Reference Number	System Requirements
6.0-9	The ASCT shall report comparisons of logged data when requested by the user: · Day to day · Hour to hour · Hour of day to hour of day · Hour of week to hour of week · day of week to day week · Day of year to day of year
6.0-10	The ASCT shall store data logs in a standard database format. Data shall be accessed per a user defined calendar and time frame form input.
6.0-11	The ASCT shall report stored data in a form suitable to provide explanations of system behavior to public and politicians and to troubleshoot the system.
6.0-12	The ASCT shall store the following data in Cycle by Cycle increments: · volume · occupancy · queue length · Green Splits · Offsets · Cycle Length
7	**7 Advanced Controller Operation**
7.0-1	When specified by the user, the ASCT shall serve a vehicle phase more than once for each time the coordinated phase is served.
7.0-2	The ASCT shall provide a minimum of 8 phase overlaps.
7.0-3	The ASCT shall accommodate a minimum of 16 phases at each signal
7.0-4	The ASCT shall accommodate a minimum of 4 rings at each signal.
7.0-5	The ASCT shall accommodate a minimum of four phases per ring
7.0-6	The ASCT shall provide a minimum of 32 different user-defined phase sequences for each signal.
7.0-6.0-1	Each permissible phase sequence shall be user-assignable to any signal timing plan.
7.0-6.0-2	Each permissible phase sequence shall be executable by a time of day schedule.
7.0-6.0-3	Each permissible phase sequence shall be executable based on measured traffic conditions
7.0-7	The ASCT shall not prevent a phase/overlap output by time-of-day.
7.0-8	The ASCT shall not prevent a phase/overlap output based on an external input.
7.0-9	The ASCT shall not prevent the following phases to be designated as coordinated phases. Phases 1 - 8

Requirements Reference Number	System Requirements
7.0-10	The ASCT shall have the option for a coordinated phase to be released early based on a user-definable point in the phase or cycle. (User select phase or cycle.)
7.0-11	The ASCT shall not prevent the controller from displaying flashing yellow arrow left turn or right turn.
7.0-12	The ASCT shall not prevent the local signal controller from performing actuated phase control using extension/passage timers as assigned to user-specified vehicle detector input channels in the local controller.
7.0-12.0-1	The ASCT shall operate adaptively using user-specified detector channels.
7.0-13	When adaptive operation is used in conjunction with normal coordination, the ASCT shall not prevent a controller serving a cycle length different from the cycles used at adjacent intersections.
7.0-14	The ASCT shall adjust adaptive operation should manual operation be put into effect (police).
7.0-15	The ASCT shall operate adaptively with the following detector logic. MDC to provide logic doc
8	**8 Pedestrians**
8.0-1	When a pedestrian phase is called, the ASCT shall execute pedestrian phases up to 3 seconds before the vehicle green of the related vehicle phase.
8.0-2	When a pedestrian phase is called, the ASCT shall accommodate pedestrian crossing times during adaptive operations.
8.0-4	The ASCT shall execute user-specified exclusive pedestrian phases during adaptive operation.
8.0-5	The ASCT shall execute pedestrian recall on user-defined phases in accordance with a time of day schedule.
8.0-6	The ASCT shall begin a non-coordinated phase later than its normal starting point within the cycle when all of the following conditions exist: · The user enables this feature; · Sufficient time in the cycle remains to serve the minimum green times for the phase and the subsequent non-coordinated phases before the beginning of the coordinated phase; · The phase is called after its normal start time; · The associated pedestrian phase is not called.
8.0-7	When specified by the user, the ASCT shall execute pedestrian recall on pedestrian phase adjacent to coordinated phases.
8.0-8	When the pedestrian phases are on recall, the ASCT shall accommodate pedestrian timing during adaptive operation.
8.0-9	The ASCT shall not inhibit negative vehicle and pedestrian phase timing.

Requirements Reference Number	System Requirements
9	**9 Special Functions**
9.0-1	The ASCT shall set a specific state for each special function output based on the occupancy on a user-specified detector.
9.0-2	The ASCT shall set a specific state for each special function output based on the current cycle length.
9.0-3	The ASCT shall set a specific state for each special function output based on a time-of-day schedule.
11	**11 Railroad and EV Preemption**
11.0-1	The ASCT shall maintain adaptive operation at non-preempted intersections during railroad and bridge preemptions.
11.0-2	The ASCT shall maintain adaptive operation at non-preempted intersections during emergency vehicle preemption.
11.0-3	The ASCT shall maintain adaptive operation at non-preempted intersections during Light Rail Transit preemption.
11.0-4	The ASCT shall resume adaptive control of signal controllers when preemptions are released.
11.0-5	The ASCT shall execute user-specified actions at non-preempted signal controllers during preemption. (E.g., inhibit a phase, activate a sign, display a message on a DMS)
11.0-6	The ASCT shall operate normally at non-preempted signal controllers when special functions are engaged by a preemption event. (Examples of such special functions are a phase omit, a phase maximum recall, a fire or bridge defined route.)
11.0-7	The ASCT shall release user-specified signal controllers to local control when one or more signals in a group are preempted.
11.0-8	The ASCT shall not prevent the local signal controller from operating in normally detected limited-service actuated mode during preemption.
11.0-9	The ASCT shall maintain adaptive operation at preempted intersections during railroad, light rail, or bridge preemption
12	**12 Transit Priority**
12.0-1	The ASCT shall continue adaptive operations of a group when one of its signal controllers has a transit priority call.
12.0-2	The ASCT shall advance the start of a user-specified green phase in response to a transit priority call.
12.0-2.0-1	The advance of start of green phase shall be user-defined.
12.0-2.0-2	Adaptive operations shall continue during the advance of the start of green phase.
12.0-3	The ASCT shall delay the end of a green phase, in response to a priority call.

Requirements Reference Number	System Requirements
12.0-3.0-1	The delay of end of green phase shall be user-defined.
12.0-3.0-2	Adaptive operations shall continue during the delay of the end of green phase.
12.0-4	The ASCT shall permit at least 4 exclusive transit phases.
12.0-4.0-1	Adaptive operations shall continue when there is an exclusive transit phase call.
12.0-5	The ASCT shall control vehicle phases independently of the following:
12.0-5.0-1	· LRT only phases
12.0-5.0-2	· Bus only phases
12.0-6	The ASCT shall interface with external future bus rapid transit priority system.
12.0-8	The ASCT shall accept a transit priority call from: · a signal controller/transit vehicle detector; · an external system.
13	**13 Failure Events and Fallback**
13.1	**13.1 Detector Failure**
13.1.0-1	The ASCT shall take user-specified action in the absence of valid detector data from user defined vehicle detectors within a group.
13.1.0-1.0-1	The ASCT shall release control to central system control.
13.1.0-1.0-2	The ASCT shall release control to local operations to operate under its own time-of-day schedule.
13.1.0-2	The ASCT shall use the following alternate data sources for operations in the absence of the real-time data from a detector:
13.1.0-2.0-1	· Data from a user-specified alternate detector.
13.1.0-2.0-2	· Stored historical data from the failed detector.
13.1.0-2.0-3	The ASCT shall switch to the alternate source in real time without operator intervention.
13.1.0-3	In the event of a detector failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.
13.1.0-4	In the event of a failure, the ASCT shall log details of the failure in a permanent log.
13.1.0-5	The permanent failure log shall be searchable, archivable, and exportable.
13.2	**13.2 Communications Failure**
13.2-1	The ASCT shall execute user-specified actions when communications to one or more signal controllers fails within a group. These include TOD, free actuated or fixed timing modes)

Requirements Reference Number	System Requirements
13.2-1.0-1	In the event of loss of communication to a user-specified signal controller, the ASCT shall release control of all signal controllers within a user-specified group to local control.
13.2-1.0-2	The ASCT shall switch to the alternate operation in real time without operator intervention.
13.2-2	In the event of communications failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.
13.2-3	The ASCT shall issue an alarm within 2 minutes of detection of a failure.
13.2-4	In the event of a communications failure, the ASCT shall log details of the failure in a permanent log.
13.2-5	The permanent failure log shall be searchable, archivable, and exportable.
13.3	**13.3 Adaptive Processor Failure**
13.3-1	The ASCT shall execute user-specified actions when adaptive control fails:
13.3-1.0-1	The ASCT shall release control to central system control.
13.3-1.0-2	The ASCT shall release control to local operations to operate under its own time-of-day schedule.
13.3-2	In the event of adaptive processor failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.
13.3-4	During adaptive processor failure, the ASCT shall provide all local detector inputs to the local controller.
14	**14 Software**
14.0-1	The vendor's adaptive software shall be fully operational within the following platform: · Windows-PC · Linux · Mac-OS
14.0-2	The ASCT shall fully satisfy all requirements when connected with detectors from manufacturer TBD.
14.0-3	The ASCT shall fully satisfy all requirements when connected with controllers (types TBD).
15	**15 Training**
15.0-1	The vendor shall provide the following training. (Edit as appropriate.)
15.0-1.0-1	The vendor shall provide training on the operations of the adaptive system.
15.0-1.0-2	The vendor shall provide training on troubleshooting the system.

Requirements Reference Number	System Requirements
15.0-1.0-3	The vendor shall provide training on preventive maintenance and repair of equipment.
15.0-1.0-4	The vendor shall provide training on system configuration.
15.0-1.0-5	The vendor shall provide training on administration of the system.
15.0-1.0-6	The vendor shall provide training on system calibration.
15.0-1.0-7	The vendor's training delivery shall include: printed course materials and references, electronic copies of presentations and references.
15.0-1.0-8	The vendor's training shall be delivered at a location specified by the Operating Agency.
15.0-1.0-9	The vendor shall provide a minimum of 12 hours training to a minimum number staff to be determined by the Operating Agency.
15.0-1.0-10	The vendor shall provide a minimum number of training sessions as determined by the Operating Agency.
16	**16 Maintenance, Support and Warranty**
16.0-1	The Maintenance Vendor shall provide maintenance according to a separate maintenance contract. That contract should identify repairs necessary to preserve requirements fulfillment, responsiveness in effecting those repairs, and all requirements on the maintenance provider while performing the repairs.
16.0-2	The Vendor shall provide routine updates to the software and software environment necessary to preserve the fulfillment of requirements for a period of three (3) years. Preservation of requirements fulfillment especially includes all IT management requirements as previously identified.
16.0-3	The Vendor shall warrant the system to be free of defects in materials and workmanship for a period of three (3) years. Warranty is defined as correcting defects in materials and workmanship (subject to other language included in the purchase documents). Defect is defined as any circumstance in which the material does not perform according to its specification.
17	**17 Schedule**
17.0-1	The ASCT shall set the state of external input/output states according to a time-of-day schedule.
17.0-2	The ASCT output states shall be settable according to a time-of-day schedule
18	**18 Performance Measurement, Monitoring and Reporting**
18.0-1	The ASCT shall report measures of current traffic conditions on which it bases signal state alterations.
18.0-2	The ASCT shall report all intermediate calculated values that are affected by calibration parameters.

Requirements Reference Number	System Requirements
18.0-3	The ASCT shall maintain a log of all signal state alterations directed by the ASCT.
18.0-3.0-1	The ASCT log shall include all events directed by the external inputs.
18.0-3.0-2	The ASCT log shall include all external output state changes.
18.0-3.0-3	The ASCT log shall include all actual parameter values that are subject to user-specified values.
18.0-3.0-4	The ASCT shall maintain the records in this ASCT log for 30 days. Once the 30 days has been met, the ASCT shall archive such data.
18.0-3.0-5	The ASCT shall archive the ASCT log and shall provide any necessary software for log retrieval

Requirements Reference Number	System Requirements
1	**1 Network Characteristics**
1.0-1	The ASCT shall control a minimum of 3000 signals concurrently
1.0-2	The ASCT shall support groups of signals.
1.0-2.0-1	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be defined by the user.
1.0-2.0-2	The ASCT shall control a minimum of 400 groups of signals.
1.0-2.0-3	The size of a group shall range from 1 to 100 signals.
1.0-2.0-4	Each group shall operate independently
1.0-2.0-5	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the ASCT system according to configured parameters.
1.0-2.0-5.0-1	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to a time of day schedule. (For example: this may be achieved by assigning signals to different groups or by combining groups.)
1.0-2.0-5.0-2	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to traffic conditions. (For example: this may be achieved by assigning signals to different groups or by combining groups.)
1.0-2.0-5.0-3	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system when commanded by the user.
2	**2 Type of Operation**
2.1	**2.1 General**

Requirements Reference Number	System Requirements
2.1.1	**2.1.1 Mode of Operation**
2.1.1.0-1	The ASCT shall operate non-adaptively during the presence of a defined condition.
2.1.1.0-2	The ASCT shall operate non-adaptively when adaptive control equipment fails.
2.1.1.0-2.0-1	The ASCT shall operate non-adaptively when a user-specified detector fails.
2.1.1.0-2.0-2	The ASCT shall operate non-adaptively when the number of failed detectors connected to a signal controller exceeds a user-defined value.
2.1.1.0-2.0-3	The ASCT shall operate non-adaptively when the number of failed detectors in a group exceeds a user-defined value.
2.1.1.0-2.0-4	The ASCT shall operate non-adaptively when a user-defined communications link fails.
2.1.1.0-3	The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptively controlling a group of signals.
2.1.1.0-4	The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptive operation.
2.1.1.0-5	The ASCT shall operate non-adaptively in accordance with a user-defined time-of-day schedule.
2.1.1.0-7	The ASCT shall alter the adaptive operation to achieve required objectives in user-specified conditions. (The required objectives are specified in Needs Statement 4.1.0-1. Responding to this requirement demonstrates how the proposed system allows the user to define the conditions at which the objectives shift and their associated requirements are fulfilled.) (The alteration may be made by adjusting parameters or by directly controlling the state of signal controllers.)
2.1.1.0-7.0-1	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of the signal controllers, maximizing the throughput of the coordinated route.
2.1.1.0-7.0-2	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers, preventing queues from exceeding the storage capacity at user-specified locations.
2.1.1.0-7.0-3	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers providing equitable distribution of green times.
2.1.1.0-7.0-4	When current measured traffic conditions meet user-defined criteria, the ASCT shall alter the state of signal controllers providing two-way progression on a coordinated route.
2.1.1.0-8	The ASCT shall provide maximum and minimum phase times.

Requirements Reference Number	System Requirements
2.1.1.0-8.0-1	The ASCT shall provide a user-specified maximum value for each phase at each signal controller.
2.1.1.0-8.0-1.0-1	The ASCT shall not provide a phase length longer that the maximum value.
2.1.1.0-8.0-2	The ASCT shall provide a user-specified minimum value for each phase at each signal controller.
2.1.1.0-8.0-2.0-1	The ASCT shall not provide a phase length shorter than the minimum value.
2.1.1.0-9	The ASCT shall detect repeated phases that do not serve all waiting vehicles. (These phase failures may be inferred, such as by detecting repeated max-out.)
2.1.1.0-9.0-1	The ASCT shall alter operations, to minimize repeated phase failures.
2.1.1.0-10	The ASCT shall determine the order of phases at a user-specified intersection. (The calculation will be based on the optimization function.)
2.1.1.0-11	The ASCT shall provide coordination along a route.
2.1.1.0-11.0-1	The ASCT shall coordinate along a user-defined route.
2.1.1.0-11.0-2	The ASCT shall determine the coordinated route based on traffic conditions.
2.1.1.0-11.0-3	The ASCT shall determine the coordinated route based on a user-defined schedule.
2.1.1.0-11.0-4.0-1	The ASCT shall implement a stored coordinated route by operator command.
2.1.1.0-11.0-4.0-2	The ASCT shall implement a stored coordinated route based on traffic conditions.
2.1.1.0-11.0-4.0-3	The ASCT shall implement a stored coordinated route based on a user-defined schedule.
2.1.1.0-12	The ASCT shall not prevent the use of phase timings in the local controller set by agency policy.
2.1.2	**2.1.2 Allowable Phases**
2.1.2.0-1	The ASCT shall not prevent protected/permissive left turn phase operation.
2.1.2.0-2	The ASCT shall not prevent the protected left turn phase to lead or lag the opposing through phase based upon user-specified conditions.
2.1.2.0-3	The ASCT shall prevent skipping a user-specified phase when the user-specified phase sequence is operating.
2.1.2.0-4	The ASCT shall prevent skipping a user-specified phase based on the state of a user-specified external input.
2.1.2.0-5	The ASCT shall prevent skipping a user-specified phase according to a time of day schedule.
2.1.2.0-6	The ASCT shall omit a user-specified phase when the cycle length is below a user-specified value.

Requirements Reference Number	System Requirements
2.1.2.0-7	The ASCT shall omit a user-specified phase based on measured traffic conditions.
2.1.2.0-8	The ASCT shall omit a user-specified phase based on the state of a user-specified external input.
2.1.2.0-9	The ASCT shall omit a user-specified phase according to a time of day schedule
2.1.2.0-10	The ASCT shall assign unused time from a preceding phase that terminates early to a user-specified phase as follows: · next phase; · next coordinated phase; · user-specified phase.
2.1.2.0-11	The ASCT shall assign unused time from a preceding phase that is skipped to a user-specified phase as follows: · previous phase; · next phase; · next coordinated phase; · user-specified phase.
2.1.2.0-12	The ASCT shall not alter the order of phases at a user-specified intersection.
2.1.3	**2.1.3 Oversaturation**
2.1.3.0-1	The ASCT shall detect the presence of queues at pre-configured locations.
2.1.3.0-2	When queues are detected at user-specified locations, the ASCT shall execute a user-specified timing plan/operational mode.
2.1.3.0-3	When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.
2.1.3.0-4	When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller.
2.1.3.0-5	The ASCT shall meter traffic into user-specified bottlenecks by storing queues at user-specified locations.
2.1.3.0-6	The ASCT shall store queues at user-specified locations.
2.1.3.0-7	The ASCT shall maintain capacity flow through user-specified bottlenecks.
2.1.3.0-8	When queues are detected at user-specified locations, the ASCT shall limit the cycle length of the group to a user-specified value.
2.2	**2.2 Sequence-based Adaptive Coordination**
2.2.0-2	(Sequence-based only) The ASCT shall select cycle length based on a time of day schedule.
2.2.0-3	(Sequence-based only) The ASCT shall calculate phase lengths for all phases at each signal controller to suit the current coordination strategy.

Requirements Reference Number	System Requirements
2.2.0-4	(Sequence-based only) The ASCT shall calculate offsets to suit the current coordination strategy for the user-specified reference point for each signal controller along a coordinated route within a group.
2.2.0-4.0-1	(Sequence-based only) The ASCT shall apply offsets for the user-specified reference point of each signal controller along a coordinated route.
2.2.0-5	(Sequence-based only) The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required elsewhere, e.g., progression, queue management, equitable distribution of green).
2.2.0-5.0-1	(Sequence-based only) The ASCT shall limit cycle lengths to user-specified values.
2.2.0-5.0-2	(Sequence-based only) The ASCT shall limit cycle lengths to a user-specified range.
2.2.0-5.0-3	(Sequence-based only) The ASCT shall calculate optimum cycle length according to the user-specified coordination strategy.
2.2.0-5.0-4	(Sequence-based only) The ASCT shall limit changes in cycle length to not exceed a user-specified value.
2.2.0-5.0-4.0-1	(Sequence-based only) The ASCT shall increase the limit for the following XX cycles based on a change in conditions.
2.2.0-5.0-4.0-1.0-1	(Sequence-based only) The change in conditions shall be defined by 5 successive adaptive increases in cycle length at the maximum rate.
2.2.0-5.0-4.0-1.0-2	(Sequence-based only) The increased limit shall be user-defined.
2.2.0-5.0-5	(Sequence-based only) The ASCT shall adjust offsets to minimize the chance of stopping vehicles approaching a signal that have been served by a user-specified phase at an upstream signal.
2.3	**2.3 Non-sequence-based adaptive coordination**
2.3.0-2	(Non-sequence-based only) The ASCT shall calculate the appropriate state of the signal to suit the current coordination strategy at the critical signal controller. (A critical signal controller is defined by the user.)
2.3.0-3	(Non-sequence-based only) At non-critical intersections within a group, the ASCT shall calculate the time at which a user-specified phase shall be green, relative to a reference point at the critical intersection, to suit the current coordination strategy.
2.3.0-4	(Non-sequence-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection.

Requirements Reference Number	System Requirements
2.3.0-5	(Non-sequence-based only) The ASCT shall adjust signal timing so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop.
2.4	**2.4 Single intersection adaptive operation**
2.4.0-2	The ASCT shall calculate a cycle length of a single intersection, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)
2.4.0-3	The ASCT shall calculate optimum phase lengths, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)
2.4.0-3.0-1	The ASCT shall limit the difference between the length of a given phase and the length of the same phase during its next service to a user-specified value.
2.4.0-3.0-2	When queues are detected at user-specified locations, the ASCT shall execute a user-specified timing plan/operational mode.
2.4.0-4	The ASCT shall calculate phase order, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)
2.5	**2.5 Phase-based adaptive coordination**
2.5.0-2	(Phase-based only) The ASCT shall alter the state of the signal controller for all phases at the user-specified intersection.
2.5.0-3	(Phase-based only) The ASCT shall calculate the time at which a user-specified phase shall be green at an intersection.
2.5.0-4	(Phase-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection.
2.5.0-5	(Phase-based only) The ASCT shall alter the operation of the non-critical intersections to minimize stopping of traffic released from user-specified phases at the user-specified critical intersection.
2.5.0-6	(Phase-based only) The ASCT shall alter the operation of the non-critical intersections to minimize stopping of traffic arriving at user-specified phases at the user-specified critical intersection.
2.5.0-7	(Phase-based only) The ASCT shall adjust the state of the signal controller so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop.
2.6	**2.6 Responsiveness**
2.6.0-1	The ASCT shall limit the change in consecutive cycle lengths to be less than a user-specified value.

Requirements Reference Number	System Requirements
2.6.0-2	The ASCT shall limit the change in phase times between consecutive cycles to be less than a user-specified value. (This does not apply to early gap-out or actuated phase skipping.)
2.6.0-3	The ASCT shall limit the changes in the direction of primary coordination to a user-specified frequency.
2.6.0-5	The ASCT shall select cycle length from a list of user-defined cycle lengths.
3	**3 External/Internal Interfaces**
3.0-1	The ASCT shall not alter the operation of existing external systems.
3.0-1.0-3	The ASCT shall not interfere with ATMS/signal software operation, data logging and monitoring
4	**4 Crossing Arterials and Boundaries**
4.0-1	The ASCT shall conform its operation to an external system's operation.
4.0-1.0-1	The ASCT shall alter its operation to minimize interruption of traffic entering the system. (This may be achieved via detection, with no direct connection to the other system.)
4.0-1.0-2	The ASCT shall operate a fixed cycle length to match the cycle length of an adjacent system.
4.0-1.0-4	The ASCT shall support adaptive coordination on crossing routes.
5	**5 Access and Security**
5.0-1	The ASCT shall be implemented with a security policy that addresses the following selected elements:
5.0-1.0-1	· Local access to the ASCT.
5.0-1.0-2	· Remote access to the ASCT.
5.0-1.0-3	· System monitoring.
5.0-1.0-4	· System manual override.
5.0-1.0-5	· Development
5.0-1.0-6	· Operations
5.0-1.0-7	· User login
5.0-1.0-8	· User password
5.0-1.0-9	· Administration of the system
5.0-1.0-10	· Signal controller group access
5.0-1.0-11	· Access to classes of equipment
5.0-1.0-12	· Access to equipment by jurisdiction
5.0-1.0-13	· Output activation
5.0-1.0-14	· System parameters
5.0-1.0-15	· Report generation

Requirements Reference Number	System Requirements
5.0-1.0-16	· Configuration
5.0-1.0-17	· Security alerts
5.0-1.0-18	· Security logging
5.0-1.0-19	· Security reporting
5.0-1.0-20	· Database
5.0-1.0-21	· Signal controller
5.0-2	The ASCT shall provide monitoring and control access at the following locations:
5.0-2.0-1	· Agency TMC
5.0-2.0-2	· Maintenance facility
5.0-2.0-3	· Operating Agency LAN or WAN
5.0-2.0-7	· Remote locations via Virtual Private Network access though cloud services (Internet)
5.0-3	The ASCT shall comply with the agency's security policy as described in ( ).
5.0-4	The ASCT shall not prevent access to the local signal controller database, monitoring or reporting functions by any installed signal management system.
6	**6 Data Log**
6.0-1	The ASCT shall log the following events:
6.0-1.0-1	Time-stamped vehicle phase calls
6.0-1.0-2	Time-stamped pedestrian phase calls
6.0-1.0-3	Time-stamped emergency vehicle preemption calls
6.0-1.0-4	Time-stamped transit priority calls
6.0-1.0-5	Time-stamped railroad preemption calls
6.0-1.0-6	Time-stamped start and end of each phase
6.0-1.0-7	Time-stamped controller interval changes
6.0-1.0-8	Time-stamped start and end of each transition to a new timing plan
6.0-2	The ASCT shall export its systems log in the following formats: · MS Excel · Text · CSV · Open source SQL database
6.0-3	The ASCT shall store the event log for a minimum of 30 days.
6.0-4	The ASCT shall store results of all signal timing parameter calculations for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data.

Requirements Reference Number	System Requirements
6.0-5	The ASCT shall store the following measured data in the form used as input to the adaptive algorithm for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data: · volume · occupancy · queue length · phase utilization · arrivals in green · green band efficiency · The ASCT shall state other measurement data or variations of this list based on exact algorithm operations
6.0-6	The ASCT system shall archive all data automatically after a user-specified period not less than 30 days.
6.0-7	The ASCT shall provide data storage for a system size of 3000 signal controllers. The data to be stored shall include the following: · Controller state data · Reports · Log data · Security data · ASCT parameters · Detector status data
6.0-8	The ASCT shall calculate and report relative data quality including: · The extent data is affected by detector faults · Other applicable items
6.0-9	The ASCT shall report comparisons of logged data when requested by the user: · Day to day · Hour to hour · Hour of day to hour of day · Hour of week to hour of week · day of week to day week · Day of year to day of year
6.0-10	The ASCT shall store data logs in a standard database format. Data shall be accessed per a user defined calendar and time frame form input.
6.0-11	The ASCT shall report stored data in a form suitable to provide explanations of system behavior to public and politicians and to troubleshoot the system.

Requirements Reference Number	System Requirements
6.0-12	The ASCT shall store the following data in Cycle by Cycle increments: · volume · occupancy · queue length · Green Splits · Offsets · Cycle Length
7	**7 Advanced Controller Operation**
7.0-1	When specified by the user, the ASCT shall serve a vehicle phase more than once for each time the coordinated phase is served.
7.0-2	The ASCT shall provide a minimum of 8 phase overlaps.
7.0-3	The ASCT shall accommodate a minimum of 16 phases at each signal
7.0-4	The ASCT shall accommodate a minimum of 4 rings at each signal.
7.0-5	The ASCT shall accommodate a minimum of four phases per ring
7.0-6	The ASCT shall provide a minimum of 32 different user-defined phase sequences for each signal.
7.0-6.0-1	Each permissible phase sequence shall be user-assignable to any signal timing plan.
7.0-6.0-2	Each permissible phase sequence shall be executable by a time of day schedule.
7.0-6.0-3	Each permissible phase sequence shall be executable based on measured traffic conditions
7.0-7	The ASCT shall not prevent a phase/overlap output by time-of-day.
7.0-8	The ASCT shall not prevent a phase/overlap output based on an external input.
7.0-9	The ASCT shall not prevent the following phases to be designated as coordinated phases. Phases 1 - 8
7.0-10	The ASCT shall have the option for a coordinated phase to be released early based on a user-definable point in the phase or cycle. (User select phase or cycle.)
7.0-11	The ASCT shall not prevent the controller from displaying flashing yellow arrow left turn or right turn.
7.0-12	The ASCT shall not prevent the local signal controller from performing actuated phase control using extension/passage timers as assigned to user-specified vehicle detector input channels in the local controller.
7.0-12.0-1	The ASCT shall operate adaptively using user-specified detector channels.

Requirements Reference Number	System Requirements
7.0-13	When adaptive operation is used in conjunction with normal coordination, the ASCT shall not prevent a controller serving a cycle length different from the cycles used at adjacent intersections.
7.0-14	The ASCT shall adjust adaptive operation should manual operation be put into effect (police).
7.0-15	The ASCT shall operate adaptively with the following detector logic. MDC to provide logic doc
8	**8 Pedestrians**
8.0-1	When a pedestrian phase is called, the ASCT shall execute pedestrian phases up to 3 seconds before the vehicle green of the related vehicle phase.
8.0-2	When a pedestrian phase is called, the ASCT shall accommodate pedestrian crossing times during adaptive operations.
8.0-4	The ASCT shall execute user-specified exclusive pedestrian phases during adaptive operation.
8.0-5	The ASCT shall execute pedestrian recall on user-defined phases in accordance with a time of day schedule.
8.0-6	The ASCT shall begin a non-coordinated phase later than its normal starting point within the cycle when all of the following conditions exist: · The user enables this feature; · Sufficient time in the cycle remains to serve the minimum green times for the phase and the subsequent non-coordinated phases before the beginning of the coordinated phase; · The phase is called after its normal start time; · The associated pedestrian phase is not called.
8.0-7	When specified by the user, the ASCT shall execute pedestrian recall on pedestrian phase adjacent to coordinated phases.
8.0-8	When the pedestrian phases are on recall, the ASCT shall accommodate pedestrian timing during adaptive operation.
8.0-9	The ASCT shall not inhibit negative vehicle and pedestrian phase timing.
9	**9 Special Functions**
9.0-1	The ASCT shall set a specific state for each special function output based on the occupancy on a user-specified detector.
9.0-2	The ASCT shall set a specific state for each special function output based on the current cycle length.
9.0-3	The ASCT shall set a specific state for each special function output based on a time-of-day schedule.
11	**11 Railroad and EV Preemption**

Requirements Reference Number	System Requirements
11.0-1	The ASCT shall maintain adaptive operation at non-preempted intersections during railroad and bridge preemptions.
11.0-2	The ASCT shall maintain adaptive operation at non-preempted intersections during emergency vehicle preemption.
11.0-3	The ASCT shall maintain adaptive operation at non-preempted intersections during Light Rail Transit preemption.
11.0-4	The ASCT shall resume adaptive control of signal controllers when preemptions are released.
11.0-5	The ASCT shall execute user-specified actions at non-preempted signal controllers during preemption. (E.g., inhibit a phase, activate a sign, display a message on a DMS)
11.0-6	The ASCT shall operate normally at non-preempted signal controllers when special functions are engaged by a preemption event. (Examples of such special functions are a phase omit, a phase maximum recall, a fire or bridge defined route.)
11.0-7	The ASCT shall release user-specified signal controllers to local control when one or more signals in a group are preempted.
11.0-8	The ASCT shall not prevent the local signal controller from operating in normally detected limited-service actuated mode during preemption.
11.0-9	The ASCT shall maintain adaptive operation at preempted intersections during railroad, light rail, or bridge preemption
12	**12 Transit Priority**
12.0-1	The ASCT shall continue adaptive operations of a group when one of its signal controllers has a transit priority call.
12.0-2	The ASCT shall advance the start of a user-specified green phase in response to a transit priority call.
12.0-2.0-1	The advance of start of green phase shall be user-defined.
12.0-2.0-2	Adaptive operations shall continue during the advance of the start of green phase.
12.0-3	The ASCT shall delay the end of a green phase, in response to a priority call.
12.0-3.0-1	The delay of end of green phase shall be user-defined.
12.0-3.0-2	Adaptive operations shall continue during the delay of the end of green phase.
12.0-4	The ASCT shall permit at least 4 exclusive transit phases.
12.0-4.0-1	Adaptive operations shall continue when there is an exclusive transit phase call.
12.0-5	The ASCT shall control vehicle phases independently of the following:

Requirements Reference Number	System Requirements
12.0-5.0-1	· LRT only phases
12.0-5.0-2	· Bus only phases
12.0-6	The ASCT shall interface with external future bus rapid transit priority system.
12.0-8	The ASCT shall accept a transit priority call from: · a signal controller/transit vehicle detector; · an external system.
13	**13 Failure Events and Fallback**
13.1	**13.1 Detector Failure**
13.1.0-1	The ASCT shall take user-specified action in the absence of valid detector data from user defined vehicle detectors within a group. (.)
13.1.0-1.0-1	The ASCT shall release control to central system control.
13.1.0-1.0-2	The ASCT shall release control to local operations to operate under its own time-of-day schedule.
13.1.0-2	The ASCT shall use the following alternate data sources for operations in the absence of the real-time data from a detector:
13.1.0-2.0-1	· Data from a user-specified alternate detector.
13.1.0-2.0-2	· Stored historical data from the failed detector.
13.1.0-2.0-3	The ASCT shall switch to the alternate source in real time without operator intervention.
13.1.0-3	In the event of a detector failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.
13.1.0-4	In the event of a failure, the ASCT shall log details of the failure in a permanent log.
13.1.0-5	The permanent failure log shall be searchable, archivable and exportable.
13.2	**13.2 Communications Failure**
13.2-1	The ASCT shall execute user-specified actions when communications to one or more signal controllers fails within a group. These include TOD, free actuated or fixed timing modes)
13.2-1.0-1	In the event of loss of communication to a user-specified signal controller, the ASCT shall release control of all signal controllers within a user-specified group to local control.
13.2-1.0-2	The ASCT shall switch to the alternate operation in real time without operator intervention.

Requirements Reference Number	System Requirements
13.2-2	In the event of communications failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.
13.2-3	The ASCT shall issue an alarm within 2 minutes of detection of a failure.
13.2-4	In the event of a communications failure, the ASCT shall log details of the failure in a permanent log.
13.2-5	The permanent failure log shall be searchable, archivable and exportable.
13.3	**13.3 Adaptive Processor Failure**
13.3-1	The ASCT shall execute user-specified actions when adaptive control fails:
13.3-1.0-1	The ASCT shall release control to central system control.
13.3-1.0-2	The ASCT shall release control to local operations to operate under its own time-of-day schedule.
13.3-2	In the event of adaptive processor failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.
13.3-4	During adaptive processor failure, the ASCT shall provide all local detector inputs to the local controller.
14	**14 Software**
14.0-1	The vendor's adaptive software shall be fully operational within the following platform: · Windows-PC · Linux · Mac-OS
14.0-2	The ASCT shall fully satisfy all requirements when connected with detectors from manufacturer TBD.
14.0-3	The ASCT shall fully satisfy all requirements when connected with controllers (types TBD).
15	**15 Training**
15.0-1	The vendor shall provide the following training. (Edit as appropriate.)
15.0-1.0-1	The vendor shall provide training on the operations of the adaptive system.
15.0-1.0-2	The vendor shall provide training on troubleshooting the system.
15.0-1.0-3	The vendor shall provide training on preventive maintenance and repair of equipment.
15.0-1.0-4	The vendor shall provide training on system configuration.
15.0-1.0-5	The vendor shall provide training on administration of the system.

Requirements Reference Number	System Requirements
15.0-1.0-6	The vendor shall provide training on system calibration.
15.0-1.0-7	The vendor's training delivery shall include: printed course materials and references, electronic copies of presentations and references.
15.0-1.0-8	The vendor's training shall be delivered at a location specified by the Operating Agency.
15.0-1.0-9	The vendor shall provide a minimum of 12 hours training to a minimum number staff to be determined by the Operating Agency.
15.0-1.0-10	The vendor shall provide a minimum number of training sessions as determined by the Operating Agency.
16	**16 Maintenance, Support and Warranty**
16.0-1	The Maintenance Vendor shall provide maintenance according to a separate maintenance contract. That contract should identify repairs necessary to preserve requirements fulfillment, responsiveness in effecting those repairs, and all requirements on the maintenance provider while performing the repairs.
16.0-2	The Vendor shall provide routine updates to the software and software environment necessary to preserve the fulfillment of requirements for a period of three (3) years. Preservation of requirements fulfillment especially includes all IT management requirements as previously identified.
16.0-3	The Vendor shall warrant the system to be free of defects in materials and workmanship for a period of three (3) years. Warranty is defined as correcting defects in materials and workmanship (subject to other language included in the purchase documents). Defect is defined as any circumstance in which the material does not perform according to its specification.
17	**17 Schedule**
17.0-1	The ASCT shall set the state of external input/output states according to a time-of-day schedule.
17.0-2	The ASCT output states shall be settable according to a time-of-day schedule
18	**18 Performance Measurement, Monitoring and Reporting**
18.0-1	The ASCT shall report measures of current traffic conditions on which it bases signal state alterations.
18.0-2	The ASCT shall report all intermediate calculated values that are affected by calibration parameters.
18.0-3	The ASCT shall maintain a log of all signal state alterations directed by the ASCT.
18.0-3.0-1	The ASCT log shall include all events directed by the external inputs.

Requirements Reference Number	System Requirements
18.0-3.0-2	The ASCT log shall include all external output state changes.
18.0-3.0-3	The ASCT log shall include all actual parameter values that are subject to user-specified values.
18.0-3.0-4	The ASCT shall maintain the records in this ASCT log for 30 days. Once the 30 days has been met, the ASCT shall archive such data.
18.0-3.0-5	The ASCT shall archive the ASCT log and shall provide any necessary software for log retrieval

4.0 VERIFICATION PLAN

The System Requirements document and list statements in the previous section are the minimum required for the Miami-Dade regional ASCT. Each of these requirements will need to be verified by the vendor during the procurement process. If a requirement is not attainable or applicable to the ASCT vendor, then those requirements shall be revisited to determine if need is necessary for their operation.

The successful vendor will be required to submit a requirements verification plan with complete system requirement reference numbers and verification statement for each requirement. It will be required that a verification traceability matrix be created by the vendor to test the requirements against the objectives as a submitted test document during the submittal process.

The verification plan will be submitted to the Operating Agency or an engineering representative for approval prior to implementing the ASCT. All verification procedures will require the presence of the vendor and Operating Agency or engineering representative to be onsite at the TMC building and in the field, as necessary, during the verification of the ASCT. Each system requirement will be verified by the vendor in the presence of the Operating Agency or their engineering representative to their satisfaction.

Full documentation and print of the final verification will be prepared by the vendor to the satisfaction of the Operating Agency or engineering representative. A record shall be maintained of each verification in the plan, the outcome of the verification recorded, and the record signed by the verifier and Operating Agency or engineering representative. The outcome of each verification shall be recorded as one of the following:

- Complied,
- Partially complied, with a statement of acceptable supplementary testing, or
- Failed, verification procedure to be repeated.

The verification shall use one or more of the following methods. This section does not explicitly state each method required for each system requirement since one ASCT system might verify a requirement differently than another. Each approved procedure shall clearly state which method(s) are to be used on the verification plan document.

- ***Demonstration:*** *used for a requirement that the system can demonstrate without external test equipment.*
- ***Test:*** *used for a requirement that requires some external piece of test equipment (such as logic analyzer and volt meter). The test and required equipment shall be clearly documented in the procedure.*
- ***Analyze:*** *used for a requirement that is met indirectly through a logical conclusion or mathematical analysis of a result. For example, algorithms for calculation of headway; setting of "late" flag; generation of priority request*

- ***Inspection:*** *is used for verification through a visual comparison. For example, quality of welding may be done through a visual comparison against an in-house standard.*

Appendix A – Traceability Matrices

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4	**4: Operational Needs**		
4.0-1	This chapter describes the operational needs of the users that should be satisfied by the proposed ASCT system. Each of these statements describes something that the system operators need to be able to achieve. Each of these needs will be satisfied by compliance with one or more system requirements. In the attached list of requirements, each one is linked to one or more of these needs statements.		
4.1	**4.1 Adaptive Strategies**		
4.1.0-1	The system operator needs the ability to implement different strategies individually or in combination to suit different prevailing traffic conditions. These strategies include:		3.4 3.5
4.1.0-1.0-1	· Maximize the throughput on coordinated routes	2.2.0-4 (Sequence-based only) The ASCT shall calculate offsets to suit the current coordination strategy for the user-specified reference point for each signal controller along a coordinated route within a group.	3.4 3.5

MDC387

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.2.0-4.0-1 (Sequence-based only) The ASCT shall apply offsets for the user-specified reference point of each signal controller along a coordinated route. 2.1.1.0-7.0-1 When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of the signal controllers, maximizing the throughput of the coordinated route. 2.2.0-5.0-3 (Sequence-based only) The ASCT shall calculate optimum cycle length according to the user-specified coordination strategy. 2.2.0-5 (Sequence-based only) The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required elsewhere, e.g., progression, queue management, equitable distribution of green).	

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.3.0-3 (Non-sequence-based only) At non-critical intersections within a group, the ASCT shall calculate the time at which a user-specified phase shall be green, relative to a reference point at the critical intersection, to suit the current coordination strategy. 2.3.0-2 (Non-sequence-based only) The ASCT shall calculate the appropriate state of the signal to suit the current coordination strategy at the critical signal controller. (A critical signal controller is defined by the user.) 2.3.0-4 (Non-sequence-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection.	

MDC389

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.1.0-7 The ASCT shall alter the adaptive operation to achieve required objectives in user-specified conditions. (The required objectives are specified in Needs Statement 4.1.0-1. Responding to this requirement demonstrates how the proposed system allows the user to define the conditions at which the objectives shift and their associated requirements are fulfilled.) (The alteration may be made by adjusting parameters or by directly controlling the state of signal controllers.) 2.2.0-2 (Sequence-based only) The ASCT shall select cycle length based on a time of day schedule. 2.2.0-5.0-1 (Sequence-based only) The ASCT shall limit cycle lengths to user-specified values. 2.2.0-5.0-2 (Sequence-based only) The ASCT shall limit cycle lengths to a user-specified range. 2.2.0-5.0-4 (Sequence-based only) The ASCT shall limit changes in cycle length to not exceed a user-specified value.	

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.2.0-5.0-4.0-1 (Sequence-based only) The ASCT shall increase the limit for the following XX cycles based on a change in conditions. 2.2.0-5.0-4.0-1.0-2 (Sequence-based only) The increased limit shall be user-defined. 2.2.0-5.0-4.0-1.0-1 (Sequence-based only) The change in conditions shall be defined by 5 successive adaptive increases in cycle length at the maximum rate. 2.1.1.0-10 The ASCT shall determine the order of phases at a user-specified intersection. (The calculation will be based on the optimization function.)	
4.1.0-1.0-2	· Provide smooth flow along coordinated routes	2.2.0-4 (Sequence-based only) The ASCT shall calculate offsets to suit the current coordination strategy for the user-specified reference point for each signal controller along a coordinated route within a group. 2.2.0-4.0-1 (Sequence-based only) The ASCT shall apply offsets for the user-specified reference point of each signal controller along a coordinated route.	

MDC391

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.1.0-7.0-4 When current measured traffic conditions meet user-defined criteria, the ASCT shall alter the state of signal controllers providing two-way progression on a coordinated route. 2.2.0-5.0-3 (Sequence-based only) The ASCT shall calculate optimum cycle length according to the user-specified coordination strategy. 2.2.0-5 (Sequence-based only) The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required elsewhere, e.g., progression, queue management, equitable distribution of green). 2.3.0-3 (Non-sequence-based only) At non-critical intersections within a group, the ASCT shall calculate the time at which a user-specified phase shall be green, relative to a reference point at the critical intersection, to suit the current coordination strategy.	

MDC392

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.3.0-2 (Non-sequence-based only) The ASCT shall calculate the appropriate state of the signal to suit the current coordination strategy at the critical signal controller. (A critical signal controller is defined by the user.) 2.3.0-4 (Non-sequence-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection. 2.2.0-2 (Sequence-based only) The ASCT shall select cycle length based on a time of day schedule. 2.2.0-5.0-1 (Sequence-based only) The ASCT shall limit cycle lengths to user-specified values. 2.2.0-5.0-2 (Sequence-based only) The ASCT shall limit cycle lengths to a user-specified range. 2.2.0-5.0-4 (Sequence-based only) The ASCT shall limit changes in cycle length to not exceed a user-specified value.	

MDC393

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.2.0-5.0-4.0-1.0-2 (Sequence-based only) The increased limit shall be user-defined. 2.1.1.0-10 The ASCT shall determine the order of phases at a user-specified intersection. (The calculation will be based on the optimization function.)	
4.1.0-1.0-3	· Distribute phase times in an equitable fashion	2.1.1.0-7.0-3 When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers providing equitable distribution of green times. 2.2.0-3 (Sequence-based only) The ASCT shall calculate phase lengths for all phases at each signal controller to suit the current coordination strategy. 2.2.0-5.0-3 (Sequence-based only) The ASCT shall calculate optimum cycle length according to the user-specified coordination strategy.	3.4 3.5

MDC394

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.2.0-5 (Sequence-based only) The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required elsewhere, e.g., progression, queue management, equitable distribution of green). 2.4.0-3 The ASCT shall calculate optimum phase lengths, based on current measured traffic conditions. (The calculation is based on the optimization objectives.) 2.3.0-3 (Non-sequence-based only) At non-critical intersections within a group, the ASCT shall calculate the time at which a user-specified phase shall be green, relative to a reference point at the critical intersection, to suit the current coordination strategy. 2.3.0-2 (Non-sequence-based only) The ASCT shall calculate the appropriate state of the signal to suit the current coordination strategy at the critical signal controller. (A critical signal controller is defined by the user.)	

MDC395

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.3.0-4 (Non-sequence-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection. 2.1.1.0-7 The ASCT shall alter the adaptive operation to achieve required objectives in user-specified conditions. (The required objectives are specified in Needs Statement 4.1.0-1. Responding to this requirement demonstrates how the proposed system allows the user to define the conditions at which the objectives shift and their associated requirements are fulfilled.) (The alteration may be made by adjusting parameters or by directly controlling the state of signal controllers.) 2.2.0-2 (Sequence-based only) The ASCT shall select cycle length based on a time of day schedule. 2.1.1.0-8.0-1 The ASCT shall provide a user-specified maximum value for each phase at each signal controller. 2.1.1.0-8.0-1.0-1 The ASCT shall not provide a phase length longer that the maximum value.	

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.1.0-8.0-2 The ASCT shall provide a user-specified minimum value for each phase at each signal controller. 2.1.1.0-8.0-2.0-1 The ASCT shall not provide a phase length shorter than the minimum value. 2.2.0-5.0-1 (Sequence-based only) The ASCT shall limit cycle lengths to user-specified values. 2.2.0-5.0-2 (Sequence-based only) The ASCT shall limit cycle lengths to a user-specified range. 2.2.0-5.0-4 (Sequence-based only) The ASCT shall limit changes in cycle length to not exceed a user-specified value. 2.1.1.0-8 The ASCT shall provide maximum and minimum phase times. 2.4.0-3.0-1 The ASCT shall limit the difference between the length of a given phase and the length of the same phase during its next service to a user-specified value.	

MDC397

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.4.0-3.0-2 When queues are detected at user-specified locations, the ASCT shall execute a user-specified timing plan/operational mode.	
4.1.0-1.0-4	· Manage the lengths of queues	2.1.3.0-2 When queues are detected at user-specified locations, the ASCT shall execute a user-specified timing plan/operational mode. 2.2.0-4 (Sequence-based only) The ASCT shall calculate offsets to suit the current coordination strategy for the user-specified reference point for each signal controller along a coordinated route within a group. 2.2.0-4.0-1 (Sequence-based only) The ASCT shall apply offsets for the user-specified reference point of each signal controller along a coordinated route. 2.1.1.0-7.0-2 When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers, preventing queues from exceeding the storage capacity at user-specified locations.	3.4 3.5

MDC398

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.2.0-5.0-3 (Sequence-based only) The ASCT shall calculate optimum cycle length according to the user-specified coordination strategy. 2.2.0-5 (Sequence-based only) The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required elsewhere, e.g., progression, queue management, equitable distribution of green). 2.3.0-3 (Non-sequence-based only) At non-critical intersections within a group, the ASCT shall calculate the time at which a user-specified phase shall be green, relative to a reference point at the critical intersection, to suit the current coordination strategy. 2.1.3.0-1 The ASCT shall detect the presence of queues at pre-configured locations. 2.3.0-2 (Non-sequence-based only) The ASCT shall calculate the appropriate state of the signal to suit the current coordination strategy at the critical signal controller. (A critical signal controller is defined by the user.)	

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.3.0-4 (Non-sequence-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection. 2.2.0-2 (Sequence-based only) The ASCT shall select cycle length based on a time of day schedule. 2.1.3.0-3 When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy. 2.1.3.0-4 When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller. 2.2.0-5.0-1 (Sequence-based only) The ASCT shall limit cycle lengths to user-specified values. 2.2.0-5.0-2 (Sequence-based only) The ASCT shall limit cycle lengths to a user-specified range.	

MDC400

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.2.0-5.0-4 (Sequence-based only) The ASCT shall limit changes in cycle length to not exceed a user-specified value. 2.1.1.0-10 The ASCT shall determine the order of phases at a user-specified intersection. (The calculation will be based on the optimization function.) 2.1.3.0-5 The ASCT shall meter traffic into user-specified bottlenecks by storing queues at user-specified locations. 2.1.3.0-6 The ASCT shall store queues at user-specified locations.	
4.1.0-1.0-5	· Manage the locations of queues within the network	2.1.3.0-2 When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode. 2.2.0-3 (Sequence-based only) The ASCT shall calculate phase lengths for all phases at each signal controller to suit the current coordination strategy . 2.1.3.0-1 The ASCT shall detect the presence of queues at pre-configured locations.	3.4 3.5

MDC401

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.3.0-3 When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy. 2.1.3.0-4 When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller. 2.1.3.0-5 The ASCT shall meter traffic into user-specified bottlenecks by storing queues at user-specified locations. 2.1.3.0-6 The ASCT shall store queues at user-specified locations. 2.1.3.0-8 When queues are detected at user-specified locations, the ASCT shall limit the cycle length of the group to a user-specified value.	
4.1.0-1.0-6	· At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).	2.4.0-2 The ASCT shall calculate a cycle length of a single intersection, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)	3.4 3.5

MDC402

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.4.0-3 The ASCT shall calculate optimum phase lengths, based on current measured traffic conditions. (The calculation is based on the optimization objectives.) 2.4.0-4 The ASCT shall calculate phase order, based on current measured traffic conditions. (The calculation is based on the optimization objectives.) 2.1.1.0-8.0-1 The ASCT shall provide a user-specified maximum value for each phase at each signal controller. 2.1.1.0-8.0-1.0-1 The ASCT shall not provide a phase length longer that the maximum value. 2.1.1.0-8.0-2 The ASCT shall provide a user-specified minimum value for each phase at each signal controller. 2.1.1.0-8.0-2.0-1 The ASCT shall not provide a phase length shorter than the minimum value. 2.1.1.0-8 The ASCT shall provide maximum and minimum phase times.	

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.4.0-3.0-1 The ASCT shall limit the difference between the length of a given phase and the length of the same phase during its next service to a user-specified value. 2.4.0-3.0-2 When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode.	
4.1.0-2	The system operator needs to manage the coordination in small groups of signals to link phase service at some intersections with phase service at adjacent intersections.	2.5.0-3 (Phase-based only) The ASCT shall calculate the time at which a user-specified phase shall be green at an intersection. 2.5.0-2 (Phase-based only) The ASCT shall alter the state of the signal controller for all phases at the user-specified intersection. 2.5.0-4 (Phase-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection.	3.4 3.5

MDC404

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.5.0-5 (Phase-based only) The ASCT shall alter the operation of the non-critical intersections to minimize stopping of traffic released from user-specified phases at the user-specified critical intersection. 2.5.0-6 (Phase-based only) The ASCT shall alter the operation of the non-critical intersections to minimize stopping of traffic arriving at user-specified phases at the user-specified critical intersection. 2.5.0-7 (Phase-based only) The ASCT shall adjust the state of the signal controller so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop.	
4.1.0-3	The system operator needs to change the operational strategy (for example, from smooth flow to maximizing throughput or managing queues) based on changing traffic conditions.	2.1.1.0-7.0-1 When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of the signal controllers, maximizing the throughput of the coordinated route.	3.4 3.5

MDC405

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.1.0-7.0-2 When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers, preventing queues from exceeding the storage capacity at user-specified locations. 2.1.1.0-7.0-3 When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers providing equitable distribution of green times. 2.1.1.0-7.0-4 When current measured traffic conditions meet user-defined criteria, the ASCT shall alter the state of signal controllers providing two-way progression on a coordinated route. 2.1.1.0-7 The ASCT shall alter the adaptive operation to achieve required objectives in user-specified conditions. (The required objectives are specified in Needs Statement 4.1.0-1. Responding to this requirement demonstrates how the proposed system allows the user to define the conditions at which the objectives shift and their associated requirements are fulfilled.) (The alteration may be made by adjusting parameters or by directly controlling the state of signal controllers.)	

MDC406

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.1.0-4	The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5.	2.1.3.0-2 When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode. 2.2.0-3 (Sequence-based only) The ASCT shall calculate phase lengths for all phases at each signal controller to suit the current coordination strategy . 2.1.3.0-1 The ASCT shall detect the presence of queues at pre-configured locations. 2.1.1.0-9 The ASCT shall detect repeated phases that do not serve all waiting vehicles. (These phase failures may be inferred, such as by detecting repeated max-out.) 2.1.1.0-9.0-1 The ASCT shall alter operations, to minimize repeated phase failures. 2.1.3.0-3 When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.	3.4 3.5

MDC407

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.3.0-4 When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller.	
4.1.0-5	The system operator needs to minimize the chance that a queue forms at a specified location.	2.3.0-5 (Non-sequence-based only) The ASCT shall adjust signal timing so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop. 2.5.0-7 (Phase-based only) The ASCT shall adjust the state of the signal controller so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop. 2.2.0-5.0-5 (Sequence-based only) The ASCT shall adjust offsets to minimize the chance of stopping vehicles approaching a signal that have been served by a user-specified phase at an upstream signal.	3.4 3.5
4.1.0-6	The system operator needs to modify the sequence of phases to support the various operational strategies.	7.0-6 The ASCT shall provide a minimum of 32 different user-defined phase sequences for each signal. 7.0-6.0-1 Each permissible phase sequence shall be user-assignable to any signal timing plan.	3.4 3.5

MDC408

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		7.0-6.0-2 Each permissible phase sequence shall be executable by a time of day schedule. 7.0-6.0-3 Each permissible phase sequence shall be executable based on measured traffic conditions 7.0-7 The ASCT shall not prevent a phase/overlap output by time-of-day. 7.0-8 The ASCT shall not prevent a phase/overlap output based on an external input. 7.0-9 The ASCT shall not prevent the following phases to be designated as coordinated phases. Phases 1 - 8	
4.1.0-7	The system operator needs to fix the sequence of phases at any specified location. For example, the operator may need to fix the phase order at a diamond interchange.	2.1.2.0-12 The ASCT shall not alter the order of phases at a user-specified intersection.	3.4 3.5
4.1.0-8	The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.	2.1.1.0-11 The ASCT shall provide coordination along a route. 2.1.1.0-11.0-1 The ASCT shall coordinate along a user-defined route.	3.4 3.5

MDC409

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.1.0-11.0-2 The ASCT shall determine the coordinated route based on traffic conditions. 2.1.1.0-11.0-3 The ASCT shall determine the coordinated route based on a user-defined schedule. 2.1.1.0-11.0-4.0-1 The ASCT shall implement a stored coordinated route by operator command. 2.1.1.0-11.0-4.0-2 The ASCT shall implement a stored coordinated route based on traffic conditions. 2.1.1.0-11.0-4.0-3 The ASCT shall implement a stored coordinated route based on a user-defined schedule.	
4.1.0-9	The system operator needs to set signal timing parameters (such as minimum green, maximum green and extension time) to comply with agency policies.	2.1.1.0-12 The ASCT shall not prevent the use of phase timings in the local controller set by agency policy.	3.4 3.5
4.2	**4.2 Network characteristics**		4.1
4.2.0-1	The system operator needs to eventually adaptively control up to 3000 signals.	1.0-1 The ASCT shall control a minimum of 3000 signals concurrently	4.1
4.2.0-2	The system operator needs to be able to adaptively control up to 400 independent groups of signals	1.0-2 The ASCT shall support groups of signals.	4.1

MDC410

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		1.0-2.0-2 The ASCT shall control a minimum of 400 groups of signals. 1.0-2.0-4 Each group shall operate independently 1.0-2.0-1 The boundaries surrounding signal controllers that operate in a coordinated fashion shall be defined by the user.	
4.2.0-3	The system operator needs to vary the number of signals in an adaptively controlled group to accommodate the prevailing traffic conditions.	1.0-2 The ASCT shall support groups of signals. 1.0-2.0-3 The size of a group shall range from 1 to 100 signals. 1.0-2.0-5.0-1 The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to a time of day schedule. (For example: this may be achieved by assigning signals to different groups or by combining groups.) 1.0-2.0-5.0-2 The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to traffic conditions. (For example: this may be achieved by assigning signals to different groups or by combining groups.)	4.1

MDC411

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		1.0-2.0-5 The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the ASCT system according to configured parameters. 1.0-2.0-5.0-3 The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system when commanded by the user.	
4.3	**4.3 Coordination across boundaries**		4.2 4.3
4.3.0-1	The system operator needs to adaptively control signals operated by various jurisdictions within the FDOT District 6. Operational jurisdictions or agencies will be specified by each specific ASCT project.	3.0-1 The ASCT shall not alter the operation of existing external systems.	4.2 4.3
4.3.0-3	The system operator needs to adaptively coordinate signals on two crossing routes simultaneously.	4.0-1.0-4 The ASCT shall support adaptive coordination on crossing routes.	4.2 4.3
4.3.0-5	The system operator needs to constrain the adaptive system to operate a cycle length compatible with the crossing arterial.	4.0-1.0-2 The ASCT shall operate a fixed cycle length to match the cycle length of an adjacent system.	4.2 4.3
4.3.0-6	The system operator needs to detect traffic approaching from a neighboring system and coordinate the ASCT operation with the adjacent system.	4.0-1.0-1 The ASCT shall alter its operation to minimize interruption of traffic entering the system. (This may be achieved via detection, with no direct connection to the other system.)	4.2 4.3

MDC412

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		4.0-1 The ASCT shall conform its operation to an external system's operation.	
4.4	4.4 Security		4.3.4
4.4.0-1	The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.	5.0-1 The ASCT shall be implemented with a security policy that addresses the following selected elements: 5.0-1.0-1 · Local access to the ASCT. 5.0-1.0-2 · Remote access to the ASCT. 5.0-1.0-3 · System monitoring. 5.0-1.0-4 · System manual override. 5.0-1.0-5 · Development 5.0-1.0-6 · Operations 5.0-1.0-7 · User login 5.0-1.0-8 · User password	4.3.4

MDC413

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		5.0-1.0-9 · Administration of the system 5.0-1.0-10 · Signal controller group access 5.0-1.0-11 · Access to classes of equipment 5.0-1.0-12 · Access to equipment by jurisdiction 5.0-1.0-13 · Output activation 5.0-1.0-14 · System parameters 5.0-1.0-15 · Report generation 5.0-1.0-16 · Configuration 5.0-1.0-17 · Security alerts 5.0-1.0-18 · Security logging 5.0-1.0-19 · Security reporting 5.0-1.0-20 · Database	

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		5.0-1.0-21 · Signal controller 5.0-3 The ASCT shall comply with the agency's security policy as described in ( ).	
4.5	**4.5 Queuing interactions**		4.4
4.5.0-1	The system operator needs to detect queues from outside the system and modify the ASCT operation to accommodate the queuing.	2.1.3.0-2 When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode. 2.1.3.0-1 The ASCT shall detect the presence of queues at pre-configured locations. 2.1.3.0-3 When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.	4.4
4.5.0-2	The system operator needs to detect queues within the system's boundaries and modify the ASCT operation to accommodate the queuing.	2.1.3.0-2 When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode. 2.1.3.0-1 The ASCT shall detect the presence of queues at pre-configured locations.	4.4

MDC415

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.3.0-3 When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.	
4.5.0-3	The system operator needs to detect queues propagating outside its boundaries from within the ASCT boundaries, and modify its operation to accommodate the queuing.	2.1.3.0-2 When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode. 2.1.3.0-1 The ASCT shall detect the presence of queues at pre-configured locations. 2.1.3.0-3 When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.	4.4
4.5.0-4	The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation.	2.1.3.0-2 When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode. 2.1.3.0-1 The ASCT shall detect the presence of queues at pre-configured locations.	4.4

MDC416

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.3.0-3 When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy. 2.1.3.0-4 When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller. 2.1.3.0-5 The ASCT shall meter traffic into user-specified bottlenecks by storing queues at user-specified locations. 2.1.3.0-6 The ASCT shall store queues at user-specified locations. 2.1.3.0-7 The ASCT shall maintain capacity flow through user-specified bottlenecks.	
4.5.0-5	The system operator needs to prevent queues forming at user-specified locations.	2.1.3.0-2 When queues are detected at user-specified locations, the ASCT shall execute user-specified timing plan/operational mode. 2.1.3.0-1 The ASCT shall detect the presence of queues at pre-configured locations.	4.4

MDC417

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.3.0-3 When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy. 2.1.3.0-4 When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller. 2.1.3.0-5 The ASCT shall meter traffic into user-specified bottlenecks by storing queues at user-specified locations. 2.1.3.0-6 The ASCT shall store queues at user-specified locations. 2.1.3.0-7 The ASCT shall maintain capacity flow through user-specified bottlenecks.	
4.6	**4.6 Pedestrians**		4.5
4.6.0-2	The system operator needs to accommodate infrequent pedestrian operation while maintaining adaptive operation. (This is appropriate for pedestrian calls that are common but not so frequent that they drive the operational needs.)	8.0-2 When a pedestrian phase is called, the ASCT shall accommodate pedestrian crossing times during adaptive operations.	4.5

MDC418

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.6.0-3	The system operator needs to incorporate frequent pedestrian operation into routine adaptive operation. (This is appropriate when pedestrians are frequent enough that they must be assumed to be present every cycle or nearly every cycle.)	8.0-2 When a pedestrian phase is called, the ASCT shall accommodate pedestrian crossing times during adaptive operations. 8.0-5 The ASCT shall execute pedestrian recall on user-defined phases in accordance with a time of day schedule. 8.0-7 When specified by the user, the ASCT shall execute pedestrian recall on pedestrian phase adjacent to coordinated phases. 8.0-8 When the pedestrian phases are on recall, the ASCT shall accommodate pedestrian timing during adaptive operation.	4.5
4.6.0-4	The system operator needs to accommodate the following custom pedestrian features: early walk, mid-block crossings, and exclusive pedestrian phases.		4.5
4.6.0-5	The system operator needs to accommodate early start of walk and exclusive pedestrian phases.	8.0-1 When a pedestrian phase is called, the ASCT shall execute pedestrian phases up to 3 seconds before the vehicle green of the related vehicle phase.	4.5

MDC419

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		8.0-4 The ASCT shall execute user-specified exclusive pedestrian phases during adaptive operation.	
4.7	**4.7 Non-adaptive situations**		4.6
4.7.0-1	The system operator needs to detect traffic conditions during which adaptive control is not the preferred operation, and implement some pre-defined operation while that condition is present.	2.1.1.0-1 The ASCT shall operate non-adaptively during the presence of a defined condition.	4.6
4.7.0-2	The system operator needs to schedule pre-determined operation by time of day.	2.1.1.0-5 The ASCT shall operate non-adaptively in accordance with a user-defined time-of-day schedule.	4.6
4.7.0-3	The system operator needs to over-ride adaptive operation.	2.1.1.0-3 The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptively controlling a group of signals. 2.1.1.0-4 The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptive operation. 2.1.1.0-5 The ASCT shall operate non-adaptively in accordance with a user-defined time-of-day schedule.	4.6

MDC420

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.8	**4.8 System responsiveness**		4.7
4.8.0-1	The system operator needs to modify the ASCT operation to closely follow changes in traffic conditions.	2.6.0-1 The ASCT shall limit the change in consecutive cycle lengths to be less than a user-specified value. 2.6.0-2 The ASCT shall limit the change in phase times between consecutive cycles to be less than a user-specified value. (This does not apply to early gap-out or actuated phase skipping.) 2.6.0-3 The ASCT shall limit the changes in the direction of primary coordination to a user-specified frequency.	4.7
4.8.0-2	The system operator needs to constrain the selection of cycle lengths to those that provide acceptable operations, such as when resonant progression solutions are desired.	2.6.0-3 The ASCT shall limit the changes in the direction of primary coordination to a user-specified frequency. 2.6.0-5 The ASCT shall select cycle length from a list of user-defined cycle lengths.	4.7
4.9	**4.9 Complex coordination and controller features**		4.8
4.9.0-1	The system operator needs to implement the following advanced controller features while maintaining adaptive operation:		4.8

MDC421

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.9.0-1.0-1	· Service a phase more than once per cycle	7.0-1 When specified by the user, the ASCT shall serve a vehicle phase more than once for each time the coordinated phase is served.	4.8
4.9.0-1.0-2	· Operate at least 8 overlap phases	7.0-2 The ASCT shall provide a minimum of 8 phase overlaps.	4.8
4.9.0-1.0-3	· Operate a minimum of four rings, 16 phases and up to four phases per ring	7.0-3 The ASCT shall accommodate a minimum of 16 phases at each signal 7.0-4 The ASCT shall accommodate a minimum of 4 rings at each signal. 7.0-5 The ASCT shall accommodate a minimum of four phases per ring	4.8
4.9.0-1.0-4	· Permit different phase sequences under different traffic conditions	7.0-6 The ASCT shall provide a minimum of 32 different user-defined phase sequences for each signal. 7.0-6.0-1 Each permissible phase sequence shall be user-assignable to any signal timing plan. 7.0-6.0-2 Each permissible phase sequence shall be executable by a time of day schedule.	4.8

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		7.0-6.0-3 Each permissible phase sequence shall be executable based on measured traffic conditions	
4.9.0-1.0-5	· Allow one or more phases to be omitted (disabled) under certain traffic conditions or signal states.	2.1.2.0-6 The ASCT shall omit a user-specified phase when the cycle length is below a user-specified value. 2.1.2.0-9 The ASCT shall omit a user-specified phase according to a time of day schedule 2.1.2.0-7 The ASCT shall omit a user-specified phase based on measured traffic conditions. 2.1.2.0-8 The ASCT shall omit a user-specified phase based on the state of a user-specified external input.	4.8
4.9.0-1.0-6	· Prevent one or more phases from being skipped under certain traffic conditions or signal states.	2.1.2.0-5 The ASCT shall prevent skipping a user-specified phase according to a time of day schedule. 2.1.2.0-3 The ASCT shall prevent skipping a user-specified phase when the user-specified phase sequence is operating.	4.8

MDC423

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.2.0-4 The ASCT shall prevent skipping a user-specified phase based on the state of a user-specified external input.	
4.9.0-1.0-7	· Allow detector logic at an intersection to be varied depending on local signal states	7.0-15 The ASCT shall operate adaptively with the following detector logic. MDC to provide logic doc	4.8
4.9.0-1.0-8	· Accommodate the following custom features used by this agency: a. Need to adjust adaptive operation should manual operation be put into effect (police).	7.0-14 The ASCT shall adjust adaptive operation should manual operation be put into effect (police).	4.8
4.9.0-1.0-9	· Allow any phase to be designated as the coordinated phase	7.0-9 The ASCT shall not prevent the following phases to be designated as coordinated phases. Phases 1 - 8	4.8
4.9.0-1.0-10	· Allow the operator to specify which phase receives unused time from a preceding phase	2.1.2.0-10 The ASCT shall assign unused time from a preceding phase that terminates early to a user-specified phase as follows: · next phase; · next coordinated phase; · user-specified phase.	4.8

MDC424

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.2.0-11 The ASCT shall assign unused time from a preceding phase that is skipped to a user-specified phase as follows: · previous phase; · next phase; · next coordinated phase; · user-specified phase.	
4.9.0-1.0-11	· Allow the controller to respond independently to individual lanes of an approach. This may be implemented in the signal controller using extension/passage timers, which may be assignable to each vehicle detector input channel. This may allow the adaptive operation to be based on data from a specific detector, or by excluding specific detectors.	7.0-12 The ASCT shall not prevent the local signal controller from performing actuated phase control using extension/passage timers as assigned to user-specified vehicle detector input channels in the local controller. 9.0-1 The ASCT shall set a specific state for each special function output based on the occupancy on a user-specified detector. 7.0-12.0-1 The ASCT shall operate adaptively using user-specified detector channels.	4.8
4.9.0-1.0-12	· Allow the coordinated phase to terminate early under prescribed traffic conditions	7.0-10 The ASCT shall have the option for a coordinated phase to be released early based on a user-definable point in the phase or cycle. (User select phase or cycle.)	4.8

MDC425

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.9.0-1.0-13	· Allow flexible timing of non-coordinated phases (such as late start of a phase) while maintaining coordination	8.0-6 The ASCT shall begin a non-coordinated phase later than its normal starting point within the cycle when all of the following conditions exist: · The user enables this feature; · Sufficient time in the cycle remains to serve the minimum green times for the phase and the subsequent non-coordinated phases before the beginning of the coordinated phase; · The phase is called after its normal start time; · The associated pedestrian phase is not called.	4.8
4.9.0-1.0-14	· Protected/permissive phasing and alternate left turn phase sequences.	2.1.2.0-1 The ASCT shall not prevent protected/permissive left turn phase operation. 2.1.2.0-2 The ASCT shall not prevent the protected left turn phase to lead or lag the opposing through phase based upon user-specified conditions.	4.8
4.9.0-1.0-15	· Use flashing yellow arrow to control permissive left turns and right turns.	7.0-11 The ASCT shall not prevent the controller from displaying flashing yellow arrow left turn or right turn.	4.8
4.9.0-1.0-16	· Service side streets and pedestrian phases at minor locations more often than at adjacent signals when this can be done without compromising the quality of the coordination. (E.g., double-cycle mid-block pedestrian crossing signals.)	7.0-13 When adaptive operation is used in conjunction with normal coordination, the ASCT shall not prevent a controller serving a cycle length different from the cycles used at adjacent intersections.	4.8

MDC426

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.9.0-1.0-17	· Use negative pedestrian phasing to prevent an overlap conflicting with a pedestrian walk/don't walk	8.0-9 The ASCT shall not inhibit negative vehicle and pedestrian phase timing.	4.8
4.1	**4.10 Monitoring and control**		4.9
4.10.0-1	The system operator needs to monitor and control all required features of adaptive operation from the following locations:	5.0-2 The ASCT shall provide monitoring and control access at the following locations:	4.9
4.10.0-1.0-1	· Various FDOT District 6 Jurisdictional TMCs. These will be defined by project	5.0-2.0-1 · Agency TMC	4.9
4.10.0-1.0-2	· Maintenance facility	5.0-2.0-2 · Maintenance facility	4.9
4.10.0-1.0-3	· Workstations on the Operating Agency's LAN or WAN located at Jurisdictional TMCs	5.0-2.0-3 · Operating Agency LAN or WAN	4.9
4.10.0-1.0-7	· Remote locations via VPN	5.0-2.0-7 · Remote locations via Virtual Private Network access though cloud services (Internet)	4.9
4.10.0-2	The operator needs to access to the database management, monitoring and reporting features and functions of the signal controllers and any related signal management system from the access points defined for those system components.	5.0-4 The ASCT shall not prevent access to the local signal controller database, monitoring or reporting functions by any installed signal management system.	4.9
4.11	**4.11 Performance reporting**		4.1
4.11.0-1	The agency needs the ATMS/signal software to be able to monitor the ASCT operation.	3.0-1.0-3 The ASCT shall not interfere with ATMS/signal software operation, data logging and monitoring	4.1

MDC427

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.11.0-2	The system operator needs to store and report data used to calculate signal timing and have the data available for subsequent analysis.	6.0-4 The ASCT shall store results of all signal timing parameter calculations for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data. 6.0-5 The ASCT shall store the following measured data in the form used as input to the adaptive algorithm for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data: · volume · occupancy · queue length · phase utilization · arrivals in green · green band efficiency · The ASCT shall state other measurement data or variations of this list based on exact algorithm operations 6.0-12 The ASCT shall store the following data in Cycle by Cycle increments: · volume · occupancy · queue length · Green Splits · Offsets · Cycle Length	4.1

MDC428

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		18.0-1 The ASCT shall report measures of current traffic conditions on which it bases signal state alterations. 18.0-2 The ASCT shall report all intermediate calculated values that are affected by calibration parameters. 18.0-3 The ASCT shall maintain a log of all signal state alterations directed by the ASCT.	
4.11.0-3	The system operator needs to store and report data that can be used to measure traffic performance under adaptive control.	6.0-4 The ASCT shall store results of all signal timing parameter calculations for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data	4.1

MDC429

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		6.0-5 The ASCT shall store the following measured data in the form used as input to the adaptive algorithm for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data: · volume · occupancy · queue length · phase utilization · arrivals in green · green band efficiency · The ASCT shall state other measurement data or variations of this list based on exact algorithm operations 6.0-12 The ASCT shall store the following data in Cycle by Cycle increments: · volume · occupancy · queue length · Green Splits · Offsets · Cycle Length	

MDC430

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.11.0-4	The system operator needs to store all operational data and signal timing parameters calculated by the adaptive system, and export selected data to current software utilized by the Operating Agency	6.0-2 The ASCT shall export its systems log in the following formats: · MS Excel · Text · CSV · Open source SQL database 6.0-3 The ASCT shall store the event log for a minimum of 30 days. 6.0-6 The ASCT system shall archive all data automatically after a user-specified period not less than 30 days. 6.0-7 The ASCT shall provide data storage for a system size of 3000 signal controllers. The data to be stored shall include the following: · Controller state data · Reports · Log data · Security data · ASCT parameters · Detector status data	4.1

MDC431

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		6.0-10 The ASCT shall store data logs in a standard database format. Data shall be accessed per a user defined calendar and time frame form input.	
4.11.0-6	The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.	6.0-1 The ASCT shall log the following events: 6.0-1.0-1 Time-stamped vehicle phase calls 6.0-1.0-2 Time-stamped pedestrian phase calls 6.0-1.0-3 Time-stamped emergency vehicle preemption calls 6.0-1.0-4 Time-stamped transit priority calls 6.0-1.0-5 Time-stamped railroad preemption calls 6.0-1.0-6 Time-stamped start and end of each phase 6.0-1.0-7 Time-stamped controller interval changes 6.0-1.0-8 Time-stamped start and end of each transition to a new timing plan	4.1

MDC432

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.11.0-7	Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.	6.0-5 The ASCT shall store the following measured data in the form used as input to the adaptive algorithm for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data: · volume · occupancy · queue length · phase utilization · arrivals in green · green band efficiency · The ASCT shall state other measurement data or variations of this list based on exact algorithm operations 6.0-8 The ASCT shall calculate and report relative data quality including: · The extent data is affected by detector faults · Other applicable items 6.0-9 The ASCT shall report comparisons of logged data when requested by the user: · Day to day · Hour to hour · Hour of day to hour of day · Hour of week to hour of week · day of week to day week · Day of year to day of year	4.1

MDC433

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		6.0-11 The ASCT shall report stored data in a form suitable to provide explanations of system behavior to public and politicians and to troubleshoot the system. 18.0-3 The ASCT shall maintain a log of all signal state alterations directed by the ASCT. 18.0-3.0-4 The ASCT shall maintain the records in this ASCT log for 30 days. Once the 30 days has been met, the ASCT shall archive such data. 18.0-3.0-5 The ASCT shall archive the ASCT log and shall provide any necessary software for log retrieval 18.0-3.0-1 The ASCT log shall include all events directed by the external inputs. 18.0-3.0-2 The ASCT log shall include all external output state changes. 18.0-3.0-3 The ASCT log shall include all actual parameter values that are subject to user-specified values.	
4.12	**4.12 Failure notification**		4.11

MDC434

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.12.0-1	The system operator needs to immediately notify maintenance and operations staff of alarms and alerts.	13.1.0-3 In the event of a detector failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system. 13.2-2 In the event of communications failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system. 13.3-2 In the event of adaptive processor failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system. 13.2-3 The ASCT shall issue an alarm within 2 minutes of detection of a failure.	4.11

MDC435

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.12.0-2	The system operator needs to immediately and automatically pass alarms and alerts to the operating agency's user defined email and phone/text system.	13.1.0-3 In the event of a detector failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system. 13.2-2 In the event of communications failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system. 13.3-2 In the event of adaptive processor failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system. 13.2-3 The ASCT shall issue an alarm within 2 minutes of detection of a failure.	4.11
4.12.0-3	The system operator needs to maintain a complete log of alarms and failure events.	13.1.0-4 In the event of a failure, the ASCT shall log details of the failure in a permanent log.	4.11

MDC436

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		13.1.0-5 The permanent failure log shall be searchable, archivable and exportable. 13.2-4 In the event of a communications failure, the ASCT shall log details of the failure in a permanent log. 13.2-5 The permanent failure log shall be searchable, archivable and exportable.	
4.13	**4.13 Preemption and priority**		4.12
4.13.0-1	The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations.	11.0-1 The ASCT shall maintain adaptive operation at non-preempted intersections during railroad and bridge preemptions. 11.0-4 The ASCT shall resume adaptive control of signal controllers when preemptions are released. 11.0-5 The ASCT shall execute user-specified actions at non-preempted signal controllers during preemption. (E.g., inhibit a phase, activate a sign, display a message on a DMS)	4.12

MDC437

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		11.0-6 The ASCT shall operate normally at non-preempted signal controllers when special functions are engaged by a preemption event. (Examples of such special functions are a phase omit, a phase maximum recall, a fire or bridge defined route.) 11.0-7 The ASCT shall release user-specified signal controllers to local control when one or more signals in a group are preempted. 11.0-8 The ASCT shall not prevent the local signal controller from operating in normally detected limited-service actuated mode during preemption. 11.0-3 The ASCT shall maintain adaptive operation at non-preempted intersections during Light Rail Transit preemption. 11.0-9 The ASCT shall maintain adaptive operation at preempted intersections during railroad, light rail, or bridge preemption	
4.13.0-2	The system operator needs to accommodate emergency vehicle preemption along pre-defined routes.	11.0-4 The ASCT shall resume adaptive control of signal controllers when preemptions are released.	4.12

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		11.0-5 The ASCT shall execute user-specified actions at non-preempted signal controllers during preemption. (E.g., inhibit a phase, activate a sign, display a message on a DMS) 11.0-6 The ASCT shall operate normally at non-preempted signal controllers when special functions are engaged by a preemption event. (Examples of such special functions are a phase omit, a phase maximum recall or a fire route.) 11.0-7 The ASCT shall release user-specified signal controllers to local control when one signal in a group is preempted. 11.0-8 The ASCT shall not prevent the local signal controller from operating in normally detected limited-service actuated mode during preemption. 11.0-2 The ASCT shall maintain adaptive operation at non-preempted intersections during emergency vehicle preemption.	
4.13.0-3	The system operator needs to accommodate bus and light rail transit signal priority	12.0-1 The ASCT shall continue adaptive operations of a group when one of its signal controllers has a transit priority call.	4.12

MDC439

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		12.0-2 The ASCT shall advance the start of a user-specified green phase in response to a transit priority call. 12.0-3 The ASCT shall delay the end of a green phase, in response to a priority call. 12.0-4 The ASCT shall permit at least 4 exclusive transit phases. 12.0-5 The ASCT shall control vehicle phases independently of the following: 12.0-6 The ASCT shall interface with external future bus rapid transit priority system. 12.0-2.0-1 The advance of start of green phase shall be user-defined. 12.0-2.0-2 Adaptive operations shall continue during the advance of the start of green phase. 12.0-3.0-1 The delay of end of green phase shall be user-defined.	
		12.0-3.0-2	

MDC440

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		Adaptive operations shall continue during the delay of the end of green phase. 12.0-4.0-1 Adaptive operations shall continue when there is an exclusive transit phase call. 12.0-5.0-1 · LRT only phases 12.0-5.0-2 · Bus only phases 12.0-8 The ASCT shall accept a transit priority call from: · a signal controller/transit vehicle detector; · an external system.	
4.13.0-4	The system operator needs to accommodate [future] light rail priority. Those needs will be defined after system has been chosen. ASCT needs to list all applicable Light Rail systems and interfaces		4.12
4.14	**4.14 Failure and fallback**		4.13
4.14.0-1	The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.	13.1.0-2 The ASCT shall use the following alternate data sources for operations in the absence of the real-time data from a detector: 13.1.0-2.0-3 The ASCT shall switch to the alternate source in real time without operator intervention.	4.13

MDC441

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		13.1.0-1 The ASCT shall take user-specified action in the absence of valid detector data from user defined vehicle detectors within a group. (.) 13.1.0-1.0-1 The ASCT shall release control to central system control. 13.2-1 The ASCT shall execute user-specified actions when communications to one or more signal controllers fails within a group. These include TOD, free actuated or fixed timing modes) 13.2-1.0-1 In the event of loss of communication to a user-specified signal controller, the ASCT shall release control of all signal controllers within a user-specified group to local control. 13.3-1 The ASCT shall execute user-specified actions when adaptive control fails: 13.3-1.0-1 The ASCT shall release control to central system control.	

MDC442

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		2.1.1.0-2 The ASCT shall operate non-adaptively when adaptive control equipment fails. 2.1.1.0-2.0-1 The ASCT shall operate non-adaptively when a user-specified detector fails. 2.1.1.0-2.0-2 The ASCT shall operate non-adaptively when the number of failed detectors connected to a signal controller exceeds a user-defined value. 2.1.1.0-2.0-3 The ASCT shall operate non-adaptively when the number of failed detectors in a group exceeds a user-defined value. 2.1.1.0-2.0-4 The ASCT shall operate non-adaptively when a user-defined communications link fails. 13.1.0-2.0-1 · Data from a user-specified alternate detector. 13.1.0-2.0-2 · Stored historical data from the failed detector. 13.1.0-1.0-2 The ASCT shall release control to local operations to operate under its own time-of-day schedule.	

MDC443

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		13.2-1.0-2 The ASCT shall switch to the alternate operation in real time without operator intervention. 13.3-1.0-2 The ASCT shall release control to local operations to operate under its own time-of-day schedule. 13.3-4 During adaptive processor failure, the ASCT shall provide all local detector inputs to the local controller.	
4.15	**4.15 Constraints**		4.14
4.15.0-1	The system operator is constrained to use the following equipment:		4.14
4.15.0-1.0-1	· Controller type (TBD)	14.0-3 The ASCT shall fully satisfy all requirements when connected with controllers (types TBD).	4.14
4.15.0-1.0-2	· Detector type (video detection, inductive loops, Other detection may be introduced in the future)	14.0-2 The ASCT shall fully satisfy all requirements when connected with detectors from manufacturer TBD.	4.14
4.15.0-1.0-3	· Communication system (IP/Ethernet)		4.14
4.15.0-1.0-4	· Cabinet type and size (Currently MD 552A, MD552X, MD 660A, MD660X. MDC is also deploying TS2 cabinets and reviewing future signal cabinet requirements)		4.14

MDC444

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.15.0-1.0-5	· Signal management system (Currently KITS. MDC is currently analyzing the need for additional/new signal management software.)	Shall allow central system to monitor signal operation	4.14
4.15.0-2	The system operator needs to use equipment and software acceptable under current agency IT policies and procedures.	14.0-1 The vendor's adaptive software shall be fully operational within the following platform: · Windows-PC · Linux · Mac-OS	4.14
4.15.0-3	Not used		
4.15.0-4	Not used		
4.16	**4.16 Training and support**		
4.16.0-1	The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.	15.0-1.0-1 The vendor shall provide training on the operations of the adaptive system. 15.0-1.0-9 The vendor shall provide a minimum of 12 hours training to a minimum number staff to be determined by the Operating Agency. 15.0-1 The vendor shall provide the following training. (Edit as appropriate.) 15.0-1.0-2 The vendor shall provide training on troubleshooting the system.	

MDC445

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
		15.0-1.0-3 The vendor shall provide training on preventive maintenance and repair of equipment. 15.0-1.0-4 The vendor shall provide training on system configuration. 15.0-1.0-5 The vendor shall provide training on administration of the system. 15.0-1.0-6 The vendor shall provide training on system calibration. 15.0-1.0-7 The vendor's training delivery shall include: printed course materials and references, electronic copies of presentations and references. 15.0-1.0-8 The vendor's training shall be delivered at a location specified by the Operating Agency. 15.0-1.0-10 The vendor shall provide a minimum number of training sessions as determined by the Operating Agency.	

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.16.0-2	The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agency therefore needs the system to be maintained to repair faults that are not defects in materials and workmanship.	16.0-1 The Maintenance Vendor shall provide maintenance according to a separate maintenance contract. That contract should identify repairs necessary to preserve requirements fulfillment, responsiveness in effecting those repairs, and all requirements on the maintenance provider while performing the repairs.	
4.16.0-3	The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agency therefore needs the system to remain free of defects in materials and workmanship that result in requirements no longer being fulfilled.	16.0-3 The Vendor shall warrant the system to be free of defects in materials and workmanship for a period of three (3) years. Warranty is defined as correcting defects in materials and workmanship (subject to other language included in the purchase documents). Defect is defined as any circumstance in which the material does not perform according to its specification.	
4.16.0-4	The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agency therefore needs support to keep software and software environment updated as necessary to prevent requirements no longer being fulfilled.	16.0-2 The Vendor shall provide routine updates to the software and software environment necessary to preserve the fulfillment of requirements for a period of three (3) years. Preservation of requirements fulfillment especially includes all IT management requirements as previously identified.	
4.17	**4.17 External interfaces**		

MDC447

Con Ops Reference Number	Concept of Operations Sample Statements	System Requirements (Tailor as required - See Guidance)	Guidance Section
4.17.0-1	The system operator needs to be able to turn on signs that control traffic or provide driver information when specific traffic conditions occur, when needed to support the adaptive operation, when congestion is detected at critical locations or according to a time-of-day schedule	17.0-1 The ASCT shall set the state of external input/output states according to a time-of-day schedule. 17.0-2 The ASCT output states shall be settable according to a time-of-day schedule 9.0-1 The ASCT shall set a specific state for each special function output based on the occupancy on a user-specified detector. 9.0-2 The ASCT shall set a specific state for each special function output based on the current cycle length. 9.0-3 The ASCT shall set a specific state for each special function output based on a time-of-day schedule.	
4.18	**4.18 Maintenance**		
4.18.0-1	Each Operating Agency needs all applicable equipment to be readily accessible.	Minimum 10% spares to be provided	

MDC448

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
1	**1 Network Characteristics**	
1.0-1	The ASCT shall control a minimum of 3000 signals concurrently	4.2.0-1 The system operator needs to eventually adaptively control up to 3000 signals.
1.0-2	The ASCT shall support groups of signals.	4.2.0-2 The system operator needs to be able to adaptively control up to 400 independent groups of signals 4.2.0-3 The system operator needs to vary the number of signals in an adaptively controlled group to accommodate the prevailing traffic conditions.
1.0-2.0-1	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be defined by the user.	4.2.0-2 The system operator needs to be able to adaptively control up to 400 independent groups of signals
1.0-2.0-2	The ASCT shall control a minimum of 400 groups of signals.	4.2.0-2 The system operator needs to be able to adaptively control up to 400 independent groups of signals
1.0-2.0-3	The size of a group shall range from 1 to 100 signals.	4.2.0-3 The system operator needs to vary the number of signals in an adaptively controlled group to accommodate the prevailing traffic conditions.
1.0-2.0-4	Each group shall operate independently	4.2.0-2 The system operator needs to be able to adaptively control up to 400 independent groups of signals

MDC449

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
1.0-2.0-5	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the ASCT system according to configured parameters.	4.2.0-3 The system operator needs to vary the number of signals in an adaptively controlled group to accommodate the prevailing traffic conditions.
1.0-2.0-5.0-1	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to a time of day schedule. (For example: this may be achieved by assigning signals to different groups or by combining groups.)	4.2.0-3 The system operator needs to vary the number of signals in an adaptively controlled group to accommodate the prevailing traffic conditions.
1.0-2.0-5.0-2	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system according to traffic conditions. (For example: this may be achieved by assigning signals to different groups or by combining groups.)	4.2.0-3 The system operator needs to vary the number of signals in an adaptively controlled group to accommodate the prevailing traffic conditions.
1.0-2.0-5.0-3	The boundaries surrounding signal controllers that operate in a coordinated fashion shall be altered by the system when commanded by the user.	4.2.0-3 The system operator needs to vary the number of signals in an adaptively controlled group to accommodate the prevailing traffic conditions.
2	**2 Type of Operation**	
2.1	**2.1 General**	
2.1.1	2.1.1 Mode of Operation	

MDC450

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.1.1.0-1	The ASCT shall operate non-adaptively during the presence of a defined condition.	4.7.0-1 The system operator needs to detect traffic conditions during which adaptive control is not the preferred operation, and implement some pre-defined operation while that condition is present.
2.1.1.0-2	The ASCT shall operate non-adaptively when adaptive control equipment fails.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
2.1.1.0-2.0-1	The ASCT shall operate non-adaptively when a user-specified detector fails.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
2.1.1.0-2.0-2	The ASCT shall operate non-adaptively when the number of failed detectors connected to a signal controller exceeds a user-defined value.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
2.1.1.0-2.0-3	The ASCT shall operate non-adaptively when the number of failed detectors in a group exceeds a user-defined value.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.1.1.0-2.0-4	The ASCT shall operate non-adaptively when a user-defined communications link fails.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
2.1.1.0-3	The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptively controlling a group of signals.	4.7.0-3 The system operator needs to over-ride adaptive operation.
2.1.1.0-4	The ASCT shall operate non-adaptively when a user manually commands the ASCT to cease adaptive operation.	4.7.0-3 The system operator needs to over-ride adaptive operation.
2.1.1.0-5	The ASCT shall operate non-adaptively in accordance with a user-defined time-of-day schedule.	4.7.0-2 The system operator needs to schedule pre-determined operation by time of day. 4.7.0-3 The system operator needs to over-ride adaptive operation.

MDC452

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.1.1.0-7	The ASCT shall alter the adaptive operation to achieve required objectives in user-specified conditions. (The required objectives are specified in Needs Statement 4.1.0-1. Responding to this requirement demonstrates how the proposed system allows the user to define the conditions at which the objectives shift and their associated requirements are fulfilled.) (The alteration may be made by adjusting parameters or by directly controlling the state of signal controllers.)	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-3 The system operator needs to change the operational strategy (for example, from smooth flow to maximizing throughput or managing queues) based on changing traffic conditions.
2.1.1.0-7.0-1	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of the signal controllers, maximizing the throughput of the coordinated route.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-3 The system operator needs to change the operational strategy (for example, from smooth flow to maximizing throughput or managing queues) based on changing traffic conditions.
2.1.1.0-7.0-2	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers, preventing queues from exceeding the storage capacity at user-specified locations.	4.1.0-1.0-4 · Manage the lengths of queues 4.1.0-3 The system operator needs to change the operational strategy (for example, from smooth flow to maximizing throughput or managing queues) based on changing traffic conditions.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.1.1.0-7.0-3	When current measured traffic conditions meet user-specified criteria, the ASCT shall alter the state of signal controllers providing equitable distribution of green times.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-3 The system operator needs to change the operational strategy (for example, from smooth flow to maximizing throughput or managing queues) based on changing traffic conditions.
2.1.1.0-7.0-4	When current measured traffic conditions meet user-defined criteria, the ASCT shall alter the state of signal controllers providing two-way progression on a coordinated route.	4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-3 The system operator needs to change the operational strategy (for example, from smooth flow to maximizing throughput or managing queues) based on changing traffic conditions.
2.1.1.0-8	The ASCT shall provide maximum and minimum phase times.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.1.1.0-8.0-1	The ASCT shall provide a user-specified maximum value for each phase at each signal controller.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.1.1.0-8.0-1.0-1	The ASCT shall not provide a phase length longer that the maximum value.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion

MDC454

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.1.1.0-8.0-2	The ASCT shall provide a user-specified minimum value for each phase at each signal controller.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.1.1.0-8.0-2.0-1	The ASCT shall not provide a phase length shorter than the minimum value.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.1.1.0-9	The ASCT shall detect repeated phases that do not serve all waiting vehicles. (These phase failures may be inferred, such as by detecting repeated max-out.)	4.1.0-4 The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.1.1.0-9.0-1	The ASCT shall alter operations, to minimize repeated phase failures.	4.1.0-4 The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5.
2.1.1.0-10	The ASCT shall determine the order of phases at a user-specified intersection. (The calculation will be based on the optimization function.)	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-4 · Manage the lengths of queues
2.1.1.0-11	The ASCT shall provide coordination along a route.	4.1.0-8 The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.
2.1.1.0-11.0-1	The ASCT shall coordinate along a user-defined route.	4.1.0-8 The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.

MDC456

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.1.1.0-11.0-2	The ASCT shall determine the coordinated route based on traffic conditions.	4.1.0-8 The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.
2.1.1.0-11.0-3	The ASCT shall determine the coordinated route based on a user-defined schedule.	4.1.0-8 The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.
2.1.1.0-11.0-4.0-1	The ASCT shall implement a stored coordinated route by operator command.	4.1.0-8 The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.
2.1.1.0-11.0-4.0-2	The ASCT shall implement a stored coordinated route based on traffic conditions.	4.1.0-8 The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.
2.1.1.0-11.0-4.0-3	The ASCT shall implement a stored coordinated route based on a user-defined schedule.	4.1.0-8 The system operator needs to designate the coordinated route based on traffic conditions and the selected operational strategy.
2.1.1.0-12	The ASCT shall not prevent the use of phase timings in the local controller set by agency policy.	4.1.0-9 The system operator needs to set signal timing parameters (such as minimum green, maximum green and extension time) to comply with agency policies.
2.1.2	2.1.2 Allowable Phases	
2.1.2.0-1	The ASCT shall not prevent protected/permissive left turn phase operation.	4.9.0-1.0-14 · Protected/permissive phasing and alternate left turn phase sequences.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.1.2.0-2	The ASCT shall not prevent the protected left turn phase to lead or lag the opposing through phase based upon user-specified conditions.	4.9.0-1.0-14 · Protected/permissive phasing and alternate left turn phase sequences.
2.1.2.0-3	The ASCT shall prevent skipping a user-specified phase when the user-specified phase sequence is operating.	4.9.0-1.0-6 · Prevent one or more phases from being skipped under certain traffic conditions or signal states.
2.1.2.0-4	The ASCT shall prevent skipping a user-specified phase based on the state of a user-specified external input.	4.9.0-1.0-6 · Prevent one or more phases from being skipped under certain traffic conditions or signal states.
2.1.2.0-5	The ASCT shall prevent skipping a user-specified phase according to a time of day schedule.	4.9.0-1.0-6 · Prevent one or more phases from being skipped under certain traffic conditions or signal states.
2.1.2.0-6	The ASCT shall omit a user-specified phase when the cycle length is below a user-specified value.	4.9.0-1.0-5 · Allow one or more phases to be omitted (disabled) under certain traffic conditions or signal states.
2.1.2.0-7	The ASCT shall omit a user-specified phase based on measured traffic conditions.	4.9.0-1.0-5 · Allow one or more phases to be omitted (disabled) under certain traffic conditions or signal states.
2.1.2.0-8	The ASCT shall omit a user-specified phase based on the state of a user-specified external input.	4.9.0-1.0-5 · Allow one or more phases to be omitted (disabled) under certain traffic conditions or signal states.
2.1.2.0-9	The ASCT shall omit a user-specified phase according to a time of day schedule	4.9.0-1.0-5 · Allow one or more phases to be omitted (disabled) under certain traffic conditions or signal states.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.1.2.0-10	The ASCT shall assign unused time from a preceding phase that terminates early to a user-specified phase as follows: · next phase; · next coordinated phase; · user-specified phase.	4.9.0-1.0-10 · Allow the operator to specify which phase receives unused time from a preceding phase
2.1.2.0-11	The ASCT shall assign unused time from a preceding phase that is skipped to a user-specified phase as follows: · previous phase; · next phase; · next coordinated phase; · user-specified phase.	4.9.0-1.0-10 · Allow the operator to specify which phase receives unused time from a preceding phase
2.1.2.0-12	The ASCT shall not alter the order of phases at a user-specified intersection.	4.1.0-7 The system operator needs to fix the sequence of phases at any specified location. For example, the operator may need to fix the phase order at a diamond interchange.
2.1.3	2.1.3 Oversaturation	
2.1.3.0-1	The ASCT shall detect the presence of queues at pre-configured locations.	4.1.0-1.0-4 · Manage the lengths of queues 4.1.0-1.0-5 · Manage the locations of queues within the network

MDC459

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.1.0-4 The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5. 4.5.0-1 The system operator needs to detect queues from outside the system and modify the ASCT operation to accommodate the queuing. 4.5.0-2 The system operator needs to detect queues within the system's boundaries and modify the ASCT operation to accommodate the queuing. 4.5.0-3 The system operator needs to detect queues propagating outside its boundaries from within the ASCT boundaries, and modify its operation to accommodate the queuing.

MDC460

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.5.0-4 The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation. 4.6.0-5 The system operator needs to accommodate early start of walk and exclusive pedestrian phases.
2.1.3.0-2	When queues are detected at user-specified locations, the ASCT shall execute a user-specified timing plan/operational mode.	4.1.0-1.0-4 · Manage the lengths of queues 4.1.0-1.0-5 · Manage the locations of queues within the network 4.1.0-4 The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5.

MDC461

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.5.0-1 The system operator needs to detect queues from outside the system and modify the ASCT operation to accommodate the queuing. 4.5.0-2 The system operator needs to detect queues within the system's boundaries and modify the ASCT operation to accommodate the queuing. 4.5.0-3 The system operator needs to detect queues propagating outside its boundaries from within the ASCT boundaries, and modify its operation to accommodate the queuing. 4.5.0-4 The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation. 4.5.0-5 The system operator needs to prevent queues forming at user-specified locations.
2.1.3.0-3	When queues are detected at user-specified locations, the ASCT shall execute user-specified adaptive operation strategy.	4.1.0-1.0-4 · Manage the lengths of queues 4.1.0-1.0-5 · Manage the locations of queues within the network

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.1.0-4 The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5. 4.5.0-1 The system operator needs to detect queues from outside the system and modify the ASCT operation to accommodate the queuing. 4.5.0-2 The system operator needs to detect queues within the system's boundaries and modify the ASCT operation to accommodate the queuing. 4.5.0-3 The system operator needs to detect queues propagating outside its boundaries from within the ASCT boundaries, and modify its operation to accommodate the queuing.

MDC463

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.5.0-4 The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation. 4.5.0-5 The system operator needs to prevent queues forming at user-specified locations.
2.1.3.0-4	When queues are detected at user-specified locations, the ASCT shall omit a user-specified phase at a user-specified signal controller.	4.1.0-1.0-4 · Manage the lengths of queues 4.1.0-1.0-5 · Manage the locations of queues within the network 4.1.0-4 The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5.

MDC464

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.5.0-4 The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation. 4.5.0-5 The system operator needs to prevent queues forming at user-specified locations.
2.1.3.0-5	The ASCT shall meter traffic into user-specified bottlenecks by storing queues at user-specified locations.	4.1.0-1.0-4 · Manage the lengths of queues 4.1.0-1.0-5 · Manage the locations of queues within the network 4.5.0-4 The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation. 4.5.0-5 The system operator needs to prevent queues forming at user-specified locations.
2.1.3.0-6	The ASCT shall store queues at user-specified locations.	4.1.0-1.0-4 · Manage the lengths of queues 4.1.0-1.0-5 · Manage the locations of queues within the network

MDC465

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.5.0-4 The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation. 4.5.0-5 The system operator needs to prevent queues forming at user-specified locations.
2.1.3.0-7	The ASCT shall maintain capacity flow through user-specified bottlenecks.	4.5.0-4 The system operator needs to store queues in locations where they can be accommodated without adversely affecting adaptive operation. 4.5.0-5 The system operator needs to prevent queues forming at user-specified locations.
2.1.3.0-8	When queues are detected at user-specified locations, the ASCT shall limit the cycle length of the group to a user-specified value.	4.1.0-1.0-5 · Manage the locations of queues within the network
2.2	**2.2 Sequence-based Adaptive Coordination**	
2.2.0-2	(Sequence-based only) The ASCT shall select cycle length based on a time of day schedule.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion

MDC466

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
		4.1.0-1.0-4 · Manage the lengths of queues
2.2.0-3	(Sequence-based only) The ASCT shall calculate phase lengths for all phases at each signal controller to suit the current coordination strategy.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-5 · Manage the locations of queues within the network 4.1.0-4 The system operator needs to detect repeated phase failures and control signal timing to prevent phase failures building up queues. The operator in this case is trying to prevent a routine queue from forming where it will block another movement in the cycle unnecessarily. For example, the operator may need to prevent a queue resulting from the trailing end of the through green from blocking the storage needed by an entering side-street left turn in the subsequent phase. An overall queue management strategy, particularly when congestion is present, is covered under 4.1.0-1.0-5.
2.2.0-4	(Sequence-based only) The ASCT shall calculate offsets to suit the current coordination strategy for the user-specified reference point for each signal controller along a coordinated route within a group.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-4 · Manage the lengths of queues

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.2.0-4.0-1	(Sequence-based only) The ASCT shall apply offsets for the user-specified reference point of each signal controller along a coordinated route.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-4 · Manage the lengths of queues
2.2.0-5	(Sequence-based only) The ASCT shall calculate a cycle length for each cycle based on its optimization objectives (as required elsewhere, e.g., progression, queue management, equitable distribution of green).	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues
2.2.0-5.0-1	(Sequence-based only) The ASCT shall limit cycle lengths to user-specified values.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.2.0-5.0-2	(Sequence-based only) The ASCT shall limit cycle lengths to a user-specified range.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues
2.2.0-5.0-3	(Sequence-based only) The ASCT shall calculate optimum cycle length according to the user-specified coordination strategy.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues
2.2.0-5.0-4	(Sequence-based only) The ASCT shall limit changes in cycle length to not exceed a user-specified value.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.2.0-5.0-4.0-1	(Sequence-based only) The ASCT shall increase the limit for the following XX cycles based on a change in conditions.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues
2.2.0-5.0-4.0-1.0-1	(Sequence-based only) The change in conditions shall be defined by 5 successive adaptive increases in cycle length at the maximum rate.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues
2.2.0-5.0-4.0-1.0-2	(Sequence-based only) The increased limit shall be user-defined.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.2.0-5.0-5	(Sequence-based only) The ASCT shall adjust offsets to minimize the chance of stopping vehicles approaching a signal that have been served by a user-specified phase at an upstream signal.	4.1.0-5 The system operator needs to minimize the chance that a queue forms at a specified location.
2.3	**2.3 Non-sequence-based adaptive coordination**	
2.3.0-2	(Non-sequence-based only) The ASCT shall calculate the appropriate state of the signal to suit the current coordination strategy at the critical signal controller. (A critical signal controller is defined by the user.)	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues
2.3.0-3	(Non-sequence-based only) At non-critical intersections within a group, the ASCT shall calculate the time at which a user-specified phase shall be green, relative to a reference point at the critical intersection, to suit the current coordination strategy.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.3.0-4	(Non-sequence-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection.	4.1.0-1.0-1 · Maximize the throughput on coordinated routes 4.1.0-1.0-2 · Provide smooth flow along coordinated routes 4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-4 · Manage the lengths of queues
2.3.0-5	(Non-sequence-based only) The ASCT shall adjust signal timing so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop.	4.1.0-5 The system operator needs to minimize the chance that a queue forms at a specified location.
2.4	**2.4 Single intersection adaptive operation**	
2.4.0-2	The ASCT shall calculate a cycle length of a single intersection, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)	4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.4.0-3	The ASCT shall calculate optimum phase lengths, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).

MDC472

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.4.0-3.0-1	The ASCT shall limit the difference between the length of a given phase and the length of the same phase during its next service to a user-specified value.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.4.0-3.0-2	When queues are detected at user-specified locations, the ASCT shall execute a user-specified timing plan/operational mode.	4.1.0-1.0-3 · Distribute phase times in an equitable fashion 4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.4.0-4	The ASCT shall calculate phase order, based on current measured traffic conditions. (The calculation is based on the optimization objectives.)	4.1.0-1.0-6 · At an isolated intersection, optimize operation with a minimum of phase failures (based on the optimization objectives).
2.5	**2.5 Phase-based adaptive coordination**	
2.5.0-2	(Phase-based only) The ASCT shall alter the state of the signal controller for all phases at the user-specified intersection.	4.1.0-2 The system operator needs to manage the coordination in small groups of signals to link phase service at some intersections with phase service at adjacent intersections.
2.5.0-3	(Phase-based only) The ASCT shall calculate the time at which a user-specified phase shall be green at an intersection.	4.1.0-2 The system operator needs to manage the coordination in small groups of signals to link phase service at some intersections with phase service at adjacent intersections.

MDC473

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.5.0-4	(Phase-based only) When demand is present, the ASCT shall implement a user-specified maximum time between successive displays of each phase at each intersection.	4.1.0-2 The system operator needs to manage the coordination in small groups of signals to link phase service at some intersections with phase service at adjacent intersections.
2.5.0-5	(Phase-based only) The ASCT shall alter the operation of the non-critical intersections to minimize stopping of traffic released from user-specified phases at the user-specified critical intersection.	4.1.0-2 The system operator needs to manage the coordination in small groups of signals to link phase service at some intersections with phase service at adjacent intersections.
2.5.0-6	(Phase-based only) The ASCT shall alter the operation of the non-critical intersections to minimize stopping of traffic arriving at user-specified phases at the user-specified critical intersection.	4.1.0-2 The system operator needs to manage the coordination in small groups of signals to link phase service at some intersections with phase service at adjacent intersections.
2.5.0-7	(Phase-based only) The ASCT shall adjust the state of the signal controller so that vehicles approaching a signal that have been served during a user-specified phase at an upstream signal do not stop.	4.1.0-5 The system operator needs to minimize the chance that a queue forms at a specified location. 4.1.0-2 The system operator needs to manage the coordination in small groups of signals to link phase service at some intersections with phase service at adjacent intersections.
2.6	**2.6 Responsiveness**	
2.6.0-1	The ASCT shall limit the change in consecutive cycle lengths to be less than a user-specified value.	4.8.0-1 The system operator needs to modify the ASCT operation to closely follow changes in traffic conditions.

MDC474

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
2.6.0-2	The ASCT shall limit the change in phase times between consecutive cycles to be less than a user-specified value. (This does not apply to early gap-out or actuated phase skipping.)	4.8.0-1 The system operator needs to modify the ASCT operation to closely follow changes in traffic conditions.
2.6.0-3	The ASCT shall limit the changes in the direction of primary coordination to a user-specified frequency.	4.8.0-1 The system operator needs to modify the ASCT operation to closely follow changes in traffic conditions. 4.8.0-2 The system operator needs to constrain the selection of cycle lengths to those that provide acceptable operations, such as when resonant progression solutions are desired.
2.6.0-5	The ASCT shall select cycle length from a list of user-defined cycle lengths.	4.8.0-2 The system operator needs to constrain the selection of cycle lengths to those that provide acceptable operations, such as when resonant progression solutions are desired.
3	**3 External/Internal Interfaces**	
3.0-1	The ASCT shall not alter the operation of existing external systems.	4.3.0-1 The system operator needs to adaptively control signals operated by various jurisdictions within the FDOT District 6. Operational jurisdictions or agencies will be specified by each specific ASCT project.
3.0-1.0-3	The ASCT shall not interfere with ATMS/signal software operation, data logging and monitoring	4.11.0-1
		The agency needs the ATMS/signal software to be able to monitor the ASCT operation.

MDC475

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
4	**4 Crossing Arterials and Boundaries**	
4.0-1	The ASCT shall conform its operation to an external system's operation.	4.3.0-6 The system operator needs to detect traffic approaching from a neighboring system and coordinate the ASCT operation with the adjacent system.
4.0-1.0-1	The ASCT shall alter its operation to minimize interruption of traffic entering the system. (This may be achieved via detection, with no direct connection to the other system.)	4.3.0-6 The system operator needs to detect traffic approaching from a neighboring system and coordinate the ASCT operation with the adjacent system.
4.0-1.0-2	The ASCT shall operate a fixed cycle length to match the cycle length of an adjacent system.	4.3.0-5 The system operator needs to constrain the adaptive system to operate a cycle length compatible with the crossing arterial.
4.0-1.0-4	The ASCT shall support adaptive coordination on crossing routes.	4.3.0-3 The system operator needs to adaptively coordinate signals on two crossing routes simultaneously.
5	**5 Access and Security**	
5.0-1	The ASCT shall be implemented with a security policy that addresses the following selected elements:	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
5.0-1.0-1	· Local access to the ASCT.	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-2	· Remote access to the ASCT.	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-3	· System monitoring.	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-4	· System manual override.	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
5.0-1.0-5	· Development	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-6	· Operations	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-7	· User login	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-8	· User password	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
5.0-1.0-9	· Administration of the system	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-10	· Signal controller group access	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-11	· Access to classes of equipment	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-12	· Access to equipment by jurisdiction	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
5.0-1.0-13	· Output activation	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-14	· System parameters	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-15	· Report generation	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-16	· Configuration	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
5.0-1.0-17	· Security alerts	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-18	· Security logging	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-19	· Security reporting	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-1.0-20	· Database	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
5.0-1.0-21	· Signal controller	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-2	The ASCT shall provide monitoring and control access at the following locations:	4.10.0-1 The system operator needs to monitor and control all required features of adaptive operation from the following locations:
5.0-2.0-1	· Agency TMC	4.10.0-1.0-1 · Various FDOT District 6 Jurisdictional TMCs. These will be defined by project
5.0-2.0-2	· Maintenance facility	4.10.0-1.0-2 · Maintenance facility
5.0-2.0-3	· Operating Agency LAN or WAN	4.10.0-1.0-3 · Workstations on the Operating Agency's LAN or WAN located at Jurisdictional TMCs
5.0-2.0-7	· Remote locations via Virtual Private Network access though cloud services (Internet)	4.10.0-1.0-7 · Remote locations via VPN

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
5.0-3	The ASCT shall comply with the agency's security policy as described in ( ).	4.4.0-1 The system operator needs to have a security management and administrative system that allows access and operational privileges to be assigned, monitored and controlled by an administrator, and conform to the agency's access and network infrastructure security policies.
5.0-4	The ASCT shall not prevent access to the local signal controller database, monitoring or reporting functions by any installed signal management system.	4.10.0-2 The operator needs to access to the database management, monitoring and reporting features and functions of the signal controllers and any related signal management system from the access points defined for those system components.
6	**6 Data Log**	
6.0-1	The ASCT shall log the following events:	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.
6.0-1.0-1	Time-stamped vehicle phase calls	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.
6.0-1.0-2	Time-stamped pedestrian phase calls	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.

MDC483

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
6.0-1.0-3	Time-stamped emergency vehicle preemption calls	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.
6.0-1.0-4	Time-stamped transit priority calls	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.
6.0-1.0-5	Time-stamped railroad preemption calls	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.
6.0-1.0-6	Time-stamped start and end of each phase	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.
6.0-1.0-7	Time-stamped controller interval changes	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.
6.0-1.0-8	Time-stamped start and end of each transition to a new timing plan	4.11.0-6 The system operator needs to be able to report the exact state of signal timing and input data for a specified period, to allow historical analysis of the system operation.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
6.0-2	The ASCT shall export its systems log in the following formats: · MS Excel · Text · CSV · Open source SQL database	4.11.0-4 The system operator needs to store all operational data and signal timing parameters calculated by the adaptive system, and export selected data to current software utilized by the Operating Agency
6.0-3	The ASCT shall store the event log for a minimum of 30 days.	4.11.0-4 The system operator needs to store all operational data and signal timing parameters calculated by the adaptive system, and export selected data to current software utilized by the Operating Agency
6.0-4	The ASCT shall store results of all signal timing parameter calculations for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data.	4.11.0-2 The system operator needs to store and report data used to calculate signal timing and have the data available for subsequent analysis. 4.11.0-3 The system operator needs to store and report data that can be used to measure traffic performance under adaptive control.

MDC485

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
6.0-5	The ASCT shall store the following measured data in the form used as input to the adaptive algorithm for a minimum of 30 days. Once the 30 days has been met, the ASCT shall archive such data: · volume · occupancy · queue length · phase utilization · arrivals in green · green band efficiency · The ASCT shall state other measurement data or variations of this list based on exact algorithm operations	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions. 4.11.0-2 The system operator needs to store and report data used to calculate signal timing and have the data available for subsequent analysis. 4.11.0-3 The system operator needs to store and report data that can be used to measure traffic performance under adaptive control.
6.0-6	The ASCT system shall archive all data automatically after a user-specified period not less than 30 days.	4.11.0-4 The system operator needs to store all operational data and signal timing parameters calculated by the adaptive system, and export selected data to current software utilized by the Operating Agency

MDC486

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
6.0-7	The ASCT shall provide data storage for a system size of 3000 signal controllers. The data to be stored shall include the following: · Controller state data · Reports · Log data · Security data · ASCT parameters · Detector status data	4.11.0-4 The system operator needs to store all operational data and signal timing parameters calculated by the adaptive system, and export selected data to current software utilized by the Operating Agency
6.0-8	The ASCT shall calculate and report relative data quality including: · The extent data is affected by detector faults · Other applicable items	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.
6.0-9	The ASCT shall report comparisons of logged data when requested by the user: · Day to day · Hour to hour · Hour of day to hour of day · Hour of week to hour of week · day of week to day week · Day of year to day of year	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.
6.0-10	The ASCT shall store data logs in a standard database format. Data shall be accessed per a user defined calendar and time frame form input.	4.11.0-4 The system operator needs to store all operational data and signal timing parameters calculated by the adaptive system, and export selected data to current software utilized by the Operating Agency

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
6.0-11	The ASCT shall report stored data in a form suitable to provide explanations of system behavior to public and politicians and to troubleshoot the system.	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.
6.0-12	The ASCT shall store the following data in Cycle by Cycle increments: · volume · occupancy · queue length · Green Splits · Offsets · Cycle Length	4.11.0-2 The system operator needs to store and report data used to calculate signal timing and have the data available for subsequent analysis. 4.11.0-3 The system operator needs to store and report data that can be used to measure traffic performance under adaptive control.
7	**7 Advanced Controller Operation**	
7.0-1	When specified by the user, the ASCT shall serve a vehicle phase more than once for each time the coordinated phase is served.	4.9.0-1.0-1 · Service a phase more than once per cycle
7.0-2	The ASCT shall provide a minimum of 8 phase overlaps.	4.9.0-1.0-2 · Operate at least 8 overlap phases
7.0-3	The ASCT shall accommodate a minimum of 16 phases at each signal	4.9.0-1.0-3 · Operate a minimum of four rings, 16 phases and up to four phases per ring

MDC488

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
7.0-4	The ASCT shall accommodate a minimum of 4 rings at each signal.	4.9.0-1.0-3 · Operate a minimum of four rings, 16 phases and up to four phases per ring
7.0-5	The ASCT shall accommodate a minimum of four phases per ring	4.9.0-1.0-3 · Operate a minimum of four rings, 16 phases and up to four phases per ring
7.0-6	The ASCT shall provide a minimum of 32 different user-defined phase sequences for each signal.	4.1.0-6 The system operator needs to modify the sequence of phases to support the various operational strategies. 4.9.0-1.0-4 · Permit different phase sequences under different traffic conditions
7.0-6.0-1	Each permissible phase sequence shall be user-assignable to any signal timing plan.	4.1.0-6 The system operator needs to modify the sequence of phases to support the various operational strategies. 4.9.0-1.0-4 · Permit different phase sequences under different traffic conditions
7.0-6.0-2	Each permissible phase sequence shall be executable by a time of day schedule.	4.1.0-6 The system operator needs to modify the sequence of phases to support the various operational strategies. 4.9.0-1.0-4 · Permit different phase sequences under different traffic conditions

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
7.0-6.0-3	Each permissible phase sequence shall be executable based on measured traffic conditions	4.1.0-6 The system operator needs to modify the sequence of phases to support the various operational strategies. 4.9.0-1.0-4 · Permit different phase sequences under different traffic conditions
7.0-7	The ASCT shall not prevent a phase/overlap output by time-of-day.	4.1.0-6 The system operator needs to modify the sequence of phases to support the various operational strategies.
7.0-8	The ASCT shall not prevent a phase/overlap output based on an external input.	4.1.0-6 The system operator needs to modify the sequence of phases to support the various operational strategies.
7.0-9	The ASCT shall not prevent the following phases to be designated as coordinated phases. (User to list all required phases.)	4.1.0-6 The system operator needs to modify the sequence of phases to support the various operational strategies. 4.9.0-1.0-9 · Allow any phase to be designated as the coordinated phase
7.0-10	The ASCT shall have the option for a coordinated phase to be released early based on a user-definable point in the phase or cycle. (User select phase or cycle.)	4.9.0-1.0-12 · Allow the coordinated phase to terminate early under prescribed traffic conditions
7.0-11	The ASCT shall not prevent the controller from displaying flashing yellow arrow left turn or right turn.	4.9.0-1.0-15 · Use flashing yellow arrow to control permissive left turns and right turns.

MDC490

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
7.0-12	The ASCT shall not prevent the local signal controller from performing actuated phase control using extension/passage timers as assigned to user-specified vehicle detector input channels in the local controller.	4.9.0-1.0-11 · Allow the controller to respond independently to individual lanes of an approach. This may be implemented in the signal controller using extension/passage timers, which may be assignable to each vehicle detector input channel. This may allow the adaptive operation to be based on data from a specific detector, or by excluding specific detectors.
7.0-12.0-1	The ASCT shall operate adaptively using user-specified detector channels.	4.9.0-1.0-11 · Allow the controller to respond independently to individual lanes of an approach. This may be implemented in the signal controller using extension/passage timers, which may be assignable to each vehicle detector input channel. This may allow the adaptive operation to be based on data from a specific detector, or by excluding specific detectors.
7.0-13	When adaptive operation is used in conjunction with normal coordination, the ASCT shall not prevent a controller serving a cycle length different from the cycles used at adjacent intersections.	4.9.0-1.0-16 · Service side streets and pedestrian phases at minor locations more often than at adjacent signals when this can be done without compromising the quality of the coordination. (E.g., double-cycle mid-block pedestrian crossing signals.)
7.0-14	The ASCT shall adjust adaptive operation should manual operation be put into effect (police).	4.9.0-1.0-8 · Accommodate the following custom features used by this agency: a. Need to adjust adaptive operation should manual operation be put into effect (police).

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
7.0-15	The ASCT shall operate adaptively with the following detector logic. MDC to provide logic doc	4.9.0-1.0-7 · Allow detector logic at an intersection to be varied depending on local signal states
8	**8 Pedestrians**	
8.0-1	When a pedestrian phase is called, the ASCT shall execute pedestrian phases up to 3 seconds before the vehicle green of the related vehicle phase.	4.6.0-5 The system operator needs to accommodate early start of walk and exclusive pedestrian phases.
8.0-2	When a pedestrian phase is called, the ASCT shall accommodate pedestrian crossing times during adaptive operations.	4.6.0-2 The system operator needs to accommodate infrequent pedestrian operation while maintaining adaptive operation. (This is appropriate for pedestrian calls that are common but not so frequent that they drive the operational needs.) 4.6.0-3 The system operator needs to incorporate frequent pedestrian operation into routine adaptive operation. (This is appropriate when pedestrians are frequent enough that they must be assumed to be present every cycle or nearly every cycle.)
8.0-4	The ASCT shall execute user-specified exclusive pedestrian phases during adaptive operation.	4.6.0-5 The system operator needs to accommodate early start of walk and exclusive pedestrian phases.

MDC492

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
8.0-5	The ASCT shall execute pedestrian recall on user-defined phases in accordance with a time of day schedule.	4.6.0-3 The system operator needs to incorporate frequent pedestrian operation into routine adaptive operation. (This is appropriate when pedestrians are frequent enough that they must be assumed to be present every cycle or nearly every cycle.)
8.0-6	The ASCT shall begin a non-coordinated phase later than its normal starting point within the cycle when all of the following conditions exist: · The user enables this feature; · Sufficient time in the cycle remains to serve the minimum green times for the phase and the subsequent non-coordinated phases before the beginning of the coordinated phase; · The phase is called after its normal start time; · The associated pedestrian phase is not called.	4.9.0-1.0-13 · Allow flexible timing of non-coordinated phases (such as late start of a phase) while maintaining coordination
8.0-7	When specified by the user, the ASCT shall execute pedestrian recall on pedestrian phase adjacent to coordinated phases.	4.6.0-3 The system operator needs to incorporate frequent pedestrian operation into routine adaptive operation. (This is appropriate when pedestrians are frequent enough that they must be assumed to be present every cycle or nearly every cycle.)
8.0-8	When the pedestrian phases are on recall, the ASCT shall accommodate pedestrian timing during adaptive operation.	4.6.0-3 The system operator needs to incorporate frequent pedestrian operation into routine adaptive operation. (This is appropriate when pedestrians are frequent enough that they must be assumed to be present every cycle or nearly every cycle.)

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
8.0-9	The ASCT shall not inhibit negative vehicle and pedestrian phase timing.	4.9.0-1.0-17 · Use negative pedestrian phasing to prevent an overlap conflicting with a pedestrian walk/don't walk
9	**9 Special Functions**	
9.0-1	The ASCT shall set a specific state for each special function output based on the occupancy on a user-specified detector.	4.9.0-1.0-11 · Allow the controller to respond independently to individual lanes of an approach. This may be implemented in the signal controller using extension/passage timers, which may be assignable to each vehicle detector input channel. This may allow the adaptive operation to be based on data from a specific detector, or by excluding specific detectors. 4.17.0-1 The system operator needs to be able to turn on signs that control traffic or provide driver information when specific traffic conditions occur, when needed to support the adaptive operation, when congestion is detected at critical locations or according to a time-of-day schedule
9.0-2	The ASCT shall set a specific state for each special function output based on the current cycle length.	4.17.0-1 The system operator needs to be able to turn on signs that control traffic or provide driver information when specific traffic conditions occur, when needed to support the adaptive operation, when congestion is detected at critical locations or according to a time-of-day schedule

MDC494

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
9.0-3	The ASCT shall set a specific state for each special function output based on a time-of-day schedule.	4.17.0-1 The system operator needs to be able to turn on signs that control traffic or provide driver information when specific traffic conditions occur, when needed to support the adaptive operation, when congestion is detected at critical locations or according to a time-of-day schedule
11	**11 Railroad and EV Preemption**	
11.0-1	The ASCT shall maintain adaptive operation at non-preempted intersections during railroad and bridge preemptions.	4.13.0-1 The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations.
11.0-2	The ASCT shall maintain adaptive operation at non-preempted intersections during emergency vehicle preemption.	4.13.0-2 The system operator needs to accommodate emergency vehicle preemption along pre-defined routes.
11.0-3	The ASCT shall maintain adaptive operation at non-preempted intersections during Light Rail Transit preemption.	4.13.0-1 The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations.
11.0-4	The ASCT shall resume adaptive control of signal controllers when preemptions are released.	4.13.0-1 The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations. 4.13.0-2 The system operator needs to accommodate emergency vehicle preemption along pre-defined routes.

MDC495

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
11.0-5	The ASCT shall execute user-specified actions at non-preempted signal controllers during preemption. (E.g., inhibit a phase, activate a sign, display a message on a DMS)	4.13.0-1 The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations. 4.13.0-2 The system operator needs to accommodate emergency vehicle preemption along pre-defined routes.
11.0-6	The ASCT shall operate normally at non-preempted signal controllers when special functions are engaged by a preemption event. (Examples of such special functions are a phase omit, a phase maximum recall, a fire or bridge defined route.)	4.13.0-1 The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations. 4.13.0-2 The system operator needs to accommodate emergency vehicle preemption along pre-defined routes.
11.0-7	The ASCT shall release user-specified signal controllers to local control when one or more signals in a group are preempted.	4.13.0-1 The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations. 4.13.0-2 The system operator needs to accommodate emergency vehicle preemption along pre-defined routes.
11.0-8	The ASCT shall not prevent the local signal controller from operating in normally detected limited-service actuated mode during preemption.	4.13.0-1 The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations. 4.13.0-2 The system operator needs to accommodate emergency vehicle preemption along pre-defined routes.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
11.0-9	The ASCT shall maintain adaptive operation at preempted intersections during railroad, light rail, or bridge preemption	4.13.0-1 The system operator needs to accommodate railroad, light rail , and bridge preemption at relevant locations.
12	**12 Transit Priority**	
12.0-1	The ASCT shall continue adaptive operations of a group when one of its signal controllers has a transit priority call.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-2	The ASCT shall advance the start of a user-specified green phase in response to a transit priority call.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-2.0-1	The advance of start of green phase shall be user-defined.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-2.0-2	Adaptive operations shall continue during the advance of the start of green phase.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-3	The ASCT shall delay the end of a green phase, in response to a priority call.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-3.0-1	The delay of end of green phase shall be user-defined.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority

MDC497

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
12.0-3.0-2	Adaptive operations shall continue during the delay of the end of green phase.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-4	The ASCT shall permit at least 4 exclusive transit phases.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-4.0-1	Adaptive operations shall continue when there is an exclusive transit phase call.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-5	The ASCT shall control vehicle phases independently of the following:	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-5.0-1	· LRT only phases	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-5.0-2	· Bus only phases	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
12.0-6	The ASCT shall interface with external future bus rapid transit priority system.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
12.0-8	The ASCT shall accept a transit priority call from: · a signal controller/transit vehicle detector; · an external system.	4.13.0-3 The system operator needs to accommodate bus and light rail transit signal priority
13	**13 Failure Events and Fallback**	
13.1	**13.1 Detector Failure**	
13.1.0-1	The ASCT shall take user-specified action in the absence of valid detector data from user defined vehicle detectors within a group.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.1.0-1.0-1	The ASCT shall release control to central system control.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.1.0-1.0-2	The ASCT shall release control to local operations to operate under its own time-of-day schedule.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.1.0-2	The ASCT shall use the following alternate data sources for operations in the absence of the real-time data from a detector:	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
13.1.0-2.0-1	· Data from a user-specified alternate detector.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.1.0-2.0-2	· Stored historical data from the failed detector.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.1.0-2.0-3	The ASCT shall switch to the alternate source in real time without operator intervention.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.1.0-3	In the event of a detector failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.	4.12.0-1 The system operator needs to immediately notify maintenance and operations staff of alarms and alerts. 4.12.0-2 The system operator needs to immediately and automatically pass alarms and alerts to the operating agency's user defined email and phone/text system.
13.1.0-4	In the event of a failure, the ASCT shall log details of the failure in a permanent log.	4.12.0-3 The system operator needs to maintain a complete log of alarms and failure events.

MDC500

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
13.1.0-5	The permanent failure log shall be searchable, archivable and exportable.	4.12.0-3 The system operator needs to maintain a complete log of alarms and failure events.
13.2	**13.2 Communications Failure**	
13.2-1	The ASCT shall execute user-specified actions when communications to one or more signal controllers fails within a group. These include TOD, free actuated or fixed timing modes)	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.2-1.0-1	In the event of loss of communication to a user-specified signal controller, the ASCT shall release control of all signal controllers within a user-specified group to local control.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.2-1.0-2	The ASCT shall switch to the alternate operation in real time without operator intervention.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
13.2-2	In the event of communications failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.	4.12.0-1 The system operator needs to immediately notify maintenance and operations staff of alarms and alerts. 4.12.0-2 The system operator needs to immediately and automatically pass alarms and alerts to the operating agency's user defined email and phone/text system.
13.2-3	The ASCT shall issue an alarm within 2 minutes of detection of a failure.	4.12.0-1 The system operator needs to immediately notify maintenance and operations staff of alarms and alerts. 4.12.0-2 The system operator needs to immediately and automatically pass alarms and alerts to the operating agency's user defined email and phone/text system.
13.2-4	In the event of a communications failure, the ASCT shall log details of the failure in a permanent log.	4.12.0-3 The system operator needs to maintain a complete log of alarms and failure events.
13.2-5	The permanent failure log shall be searchable, archivable and exportable.	4.12.0-3 The system operator needs to maintain a complete log of alarms and failure events.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
13.3	**13.3 Adaptive Processor Failure**	
13.3-1	The ASCT shall execute user-specified actions when adaptive control fails:	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.3-1.0-1	The ASCT shall release control to central system control.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.3-1.0-2	The ASCT shall release control to local operations to operate under its own time-of-day schedule.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
13.3-2	In the event of adaptive processor failure, the ASCT shall issue an alarm to user-specified recipients. (This requirement may be fulfilled by sending the alarm to a designated list of recipients by a designated means, or by using an external maintenance management system.	4.12.0-1 The system operator needs to immediately notify maintenance and operations staff of alarms and alerts. 4.12.0-2 The system operator needs to immediately and automatically pass alarms and alerts to the operating agency's user defined email and phone/text system.

MDC503

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
13.3-4	During adaptive processor failure, the ASCT shall provide all local detector inputs to the local controller.	4.14.0-1 The system operator needs to fall back to TOD or isolated free operation, as specified by the operator, without causing disruption to traffic flow, in the event of equipment, communications and/or software failure.
14	**14 Software**	
14.0-1	The vendor's adaptive software shall be fully operational within the following platform: · Windows-PC · Linux · Mac-OS	4.15.0-2 The system operator needs to use equipment and software acceptable under current agency IT policies and procedures.
14.0-2	The ASCT shall fully satisfy all requirements when connected with detectors from manufacturer TBD.	4.15.0-1.0-2 · Detector type (video detection, inductive loops, Other detection may be introduced in the future)
14.0-3	The ASCT shall fully satisfy all requirements when connected with controllers (types TBD).	4.15.0-1.0-1 · Controller type (TBD)
15	**15 Training**	
15.0-1	The vendor shall provide the following training. (Edit as appropriate.)	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
15.0-1.0-1	The vendor shall provide training on the operations of the adaptive system.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.

MDC504

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
15.0-1.0-2	The vendor shall provide training on troubleshooting the system.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
15.0-1.0-3	The vendor shall provide training on preventive maintenance and repair of equipment.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
15.0-1.0-4	The vendor shall provide training on system configuration.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
15.0-1.0-5	The vendor shall provide training on administration of the system.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
15.0-1.0-6	The vendor shall provide training on system calibration.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
15.0-1.0-7	The vendor's training delivery shall include: printed course materials and references, electronic copies of presentations and references.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
15.0-1.0-8	The vendor's training shall be delivered at a location specified by the Operating Agency.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
15.0-1.0-9	The vendor shall provide a minimum of 12 hours training to a minimum number staff to be determined by the Operating Agency.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
15.0-1.0-10	The vendor shall provide a minimum number of training sessions as determined by the Operating Agency.	4.16.0-1 The Operating Agency needs all staff involved in operation and maintenance to receive appropriate training.
16	**16 Maintenance, Support and Warranty**	
16.0-1	The Maintenance Vendor shall provide maintenance according to a separate maintenance contract. That contract should identify repairs necessary to preserve requirements fulfillment, responsiveness in effecting those repairs, and all requirements on the maintenance provider while performing the repairs.	4.16.0-2 The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agencies therefore needs the system to be maintained to repair faults that are not defects in materials and workmanship.
16.0-2	The Vendor shall provide routine updates to the software and software environment necessary to preserve the fulfillment of requirements for a period of three (3) years. Preservation of requirements fulfillment especially includes all IT management requirements as previously identified.	4.16.0-4 The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agency therefore needs support to keep software and software environment updated as necessary to prevent requirements no longer being fulfilled.
16.0-3	The Vendor shall warrant the system to be free of defects in materials and workmanship for a period of three (3) years. Warranty is defined as correcting defects in materials and workmanship (subject to other language included in the purchase documents). Defect is defined as any circumstance in which the material does not perform according to its specification.	4.16.0-3 The Operating Agency needs the system to fulfill all requirements for the life of the system. The Operating Agency therefore needs the system to remain free of defects in materials and workmanship that result in requirements no longer being fulfilled.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
17	**17 Schedule**	
17.0-1	The ASCT shall set the state of external input/output states according to a time-of-day schedule.	4.17.0-1 The system operator needs to be able to turn on signs that control traffic or provide driver information when specific traffic conditions occur, when needed to support the adaptive operation, when congestion is detected at critical locations or according to a time-of-day schedule
17.0-2	The ASCT output states shall be settable according to a time-of-day schedule	4.17.0-1 The system operator needs to be able to turn on signs that control traffic or provide driver information when specific traffic conditions occur, when needed to support the adaptive operation, when congestion is detected at critical locations or according to a time-of-day schedule
18	**18 Performance Measurement, Monitoring and Reporting**	
18.0-1	The ASCT shall report measures of current traffic conditions on which it bases signal state alterations.	4.11.0-2 The system operator needs to store and report data used to calculate signal timing and have the data available for subsequent analysis.
18.0-2	The ASCT shall report all intermediate calculated values that are affected by calibration parameters.	4.11.0-2 The system operator needs to store and report data used to calculate signal timing and have the data available for subsequent analysis.

MDC507

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
18.0-3	The ASCT shall maintain a log of all signal state alterations directed by the ASCT.	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions. 4.11.0-2 The system operator needs to store and report data used to calculate signal timing and have the data available for subsequent analysis.
18.0-3.0-1	The ASCT log shall include all events directed by the external inputs.	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.
18.0-3.0-2	The ASCT log shall include all external output state changes.	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.
18.0-3.0-3	The ASCT log shall include all actual parameter values that are subject to user-specified values.	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.
18.0-3.0-4	The ASCT shall maintain the records in this ASCT log for 30 days. Once the 30 days has been met, the ASCT shall archive such data.	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.

Requirements Document Reference Number	System Requirements Sample Requirements	User Need Satisfied
18.0-3.0-5	The ASCT shall archive the ASCT log and shall provide any necessary software for log retrieval	4.11.0-7 Have the ability to generate historic and real-time reports that effectively support operation, maintenance and reporting of system performance and traffic conditions.

Exhibit 13

Miami-Dade County DTPW Specification Section 527 (Detectable Warnings on Walking Surfaces)

MIAMI-DADE COUNTY DTPW SPECIFICATION SECTION 527
DETECTABLE WARNINGS ON WALKING SURFACES (REV. 08-16-18)

A. Description.

1. Furnish and install Safety Yellow Colored Detectable Warning devices on newly constructed and/or existing concrete or asphalt walking surfaces (curb ramps, sidewalks, shared-use paths, etc.) constructed in accordance with the FDOT Standard Plans, Index 522-002 and these specifications, where indicated on the Plans or directed by the Engineer.

B. Materials.

1. General:
   a. Provide Detectable Warnings in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705.
   b. Provide only embedded Detectable Warning devices, set in wet concrete, for all construction except where retrofit applications of surface applied detectable warnings have been approved in writing by Engineer.
   c. Use Detectable Warnings consisting of materials intended for exterior use subject to routine pedestrian traffic and occasional vehicular traffic.
   d. Use Detectable Warnings with size and pattern shown in the plans comprised of truncated domes aligned in parallel rows in accordance with the FDOT Standard Plans, Index 522-002. Do not use detectable warnings with a diagonal pattern.
   e. Concrete stamping, field-formed materials, or methods or products used to form Detectable Warnings in wet concrete are not permitted.
2. Material Properties:
   a. Provide Detectable Warnings that meet the following minimum material property requirements when tested in accordance with the indicated Standard appropriate to the material.

PROPERTY	STANDARD	TEST VALUE
Slip Resistance	FM 3-C 1028	Dry Coefficient of Friction – 0.8 min. Wet Coefficient of Friction – 0.65 min. (include recessed areas between truncated domes)
Wear Resistance	FM 5-594	Average Volume Loss: no more than 0.06 cm3
Water Absorption*	ASTM D-570	Not to exceed 5%.
Adhesion/Bond Strength**	FM 5-589	150 psi min. tensile adhesion strength
Non-Hazardous Classification	Submit Material Safety Data Sheet (MSDS)	Non-Hazardous, per RCRA Subtitle C
* Applies only to plastic materials. ** Applies only to surface-applied materials.		

3. Color/Contrast: Use Safety Yellow colored Detectable Warnings on concrete or asphalt walking surfaces. Acceptable Detectable Warnings must maintain a Light Reflectance Value (LRV) CAP Y of 25 – 45, as measured with a spectrophotometer, for a minimum duration of three years.
4. Approved Products List:
   a. Use Detectable Warnings listed on the FDOT Approved Products List (APL) and that have been further evaluated and found acceptable by the Department. At the option of the Contractor, an “or equal” product evaluation request, for an equivalent FDOT APL approved product that meets or exceeds the specification stipulated herein, may be submitted in writing to the Engineer for review and acceptance.
   b. The following products, subject to continued listing on the FDOT APL, have been evaluated by the Department for use on Department projects:

SURFACE APPLIED DETECTABLE WARNING DEVICES		
Manufacturer	**Product**	**APL Number**
Engineered Plastics, Inc.	Armor-Tile Surface Applied Inline Dome	527-000-006
TufTile	TufTile Polymer (Surface Applied)	527-000-045
TufTile	TufTile Polymer (Surface Applied) Radius	527-000-045-RW

EMBEDDED DETECTABLE WARNING DEVICES		
Manufacturer	**Product**	**APL Number**
ADA Solutions, Inc.	Cast-In-Place Composite Tactile	527-000-003
ADA Solutions, Inc.	Replaceable Wet Set Composite	527-000-018
Engineered Plastics, Inc	Armor-Tile Replaceable Cast in Place	527-000-026
Engineered Plastics, Inc.	Armor-Tile Cast-In-Place Inline Dome Tile	527-000-027
Cape Fear Systems, LLC	AlertCast (Replaceable) Cast-In-Place	527-000-029
Access Products, Inc.	Access Tile Replaceable Cast in Place	527-000-033
StrongGo Industries	TekWay Dome Tile	527-000-035
TufTile, Inc	TufTile Cast Iron (Wet-set) Replaceable	527-000-044
TufTile	TufTile Polymer (Wet Set) Replaceable	527-000-046
TufTile	TufTile Polymer (Wet Set) Radius	527-000-046-RW

C. Installation Procedures.

1. Surface Preparation and Installation: Prepare the surface in accordance with the manufacturer's recommendations. Use only products and materials appropriate for the surface on which they will be applied. Install in accordance with the manufacturer's instructions, using materials and equipment recommended and approved by the manufacturer. For surface-applied tiles or mats, use adhesives applied over the entire surface and mechanical fasteners.

D. Method of Measurement.

1. The quantity to be paid for will be the area, in square feet, of Detectable Warnings furnished and installed pursuant to these specifications, measured in place and accepted by the Engineer.

E. Basis of Payment.

1. Price and payment will be full compensation for all work specified in this Article, including all labor, surface preparation, materials and incidentals necessary to complete the work for installation of Detectable Warnings on walking surfaces.
2. Payment will be made under:

Item No.	Description	Unit
527-2	Detectable Warning On Walking Surface	SF

Exhibit 14

Miami-Dade County DTPW Specification Section 110 (Clearing and Grubbing)

1.01 CLEARING AND GRUBBING (REV. 5-16-11)

A. General.

1. Perform all Clearing and Grubbing required by the Contract Documents or necessary to prepare the Project site for the proposed construction.
2. Remove and dispose of all structures, material, product and debris not required to be salvaged or not required to complete the construction.
3. Trim trees and shrubs within the Project right-of-way that are required by the Contract Documents or necessary for the construction of the Project.
4. Perform the work and meet all the requirements for the miscellaneous operations described in Subarticle B.6 herein.
5. Protect and do not displace structures which are to remain in place.

B. Clearing and Grubbing:

1. Standard Clearing and Grubbing.

a. Perform Standard Clearing and Grubbing within:

1) Right-of-way of the roadway to be constructed.

2) All Project areas, whether or not shown in the Plans, that require Clearing and Grubbing including:

a) Areas where excavation is to be done.

b) Areas where roadway embankments will be constructed.

c) Areas where structures will be constructed or installed.

b. Work includes complete removal and disposal of:

1) All buildings, structures, appurtenances, existing pavement, trees, plants, vegetation, timber, brush, stumps, roots, rubbish, debris, and all other obstructions resting on or protruding through the surface of the existing ground and the surface of excavated areas.

2) All other structures and obstructions necessary to be removed and for which other items of the Contract do not specify the removal thereof.

3) Any boulders encountered in the roadway excavation or found on the surface of the ground unless otherwise permitted by the Contract Documents

c. Depths of Removal of Roots, Stumps, and Other Debris:

1) Completely remove and dispose of all stumps found within the roadway right-of-way.

2) Remove roots and other debris from all excavated material to be used in the construction of roadway embankment.

3) In all areas where excavation is to be performed or roadway embankments are to be constructed, plow the surface to a depth of at least 6 inches, and remove roots and other debris to a depth of 12 inches below the ground surface.

4) Remove all roots and other debris protruding through or appearing on the surface of the completed excavation within the roadway area and for structures, to a depth of at least 12 inches below the finished excavation surface.

5) In borrow pits, material pits, and lateral ditches, remove or cut off all stumps, roots, etc. below the surface of the completed excavation. Do not perform any clearing or grubbing within 3 feet inside the right-of-way line in borrow and material pits.

6) Within all other areas where Standard Clearing and Grubbing is to be performed, remove roots and other debris projecting through or appearing on the surface of the original ground to a depth of 12 inches below the surface, but do not plow or harrow these areas.

d. Trees to Remain:

1) As an exception to the above provisions, where so directed by the Engineer, trim, protect, and leave standing desirable trees within the Project area.

2) Trim branches of trees extending over the area occupied by the roadway as directed, to give a clear height of 16 feet above the roadway.

2. Selective Clearing and Grubbing.

a. Perform Selective Clearing and Grubbing only in areas so designated in the Plans or where directed by the Engineer.

b. Completely remove and dispose of stumps and remove and dispose of all vegetation, obstructions, etc., as required for Standard Clearing and Grubbing except that, where so elected, the Contractor may cut roots flush with the ground surface.

c. Entirely remove undergrowth except in specific areas designated by the Engineer to remain for aesthetic purposes.

d. Trim, protect, and leave standing desirable trees, with the exception of such trees as the Engineer may designate to be removed in order to facilitate right-of-way maintenance. Remove undesirable or damaged trees as so designated by the Engineer.

3. Removal of Buildings.

a. Completely remove all parts of the buildings, including utilities, plumbing, foundations, floors, basements, steps, connecting concrete sidewalks or other

pavement, septic tanks, and any other appurtenances, by any practical manner which is not detrimental to other property and improvements. Remove utilities to the point of connection to the utility authority's cut-in.

b. After removing the sewer connections to the point of cut-in, construct a concrete plug at the cut-in point, as directed by the Engineer, except where the utility owners may elect to perform their own plugging. Contact the appropriate utility companies prior to removal of any part of the building to ensure disconnection of services.

c. Removal by Others: Where buildings within the area to be cleared and grubbed are so specified to be removed by others, remove and dispose of any foundations, curtain walls, concrete floors, basements or other foundation parts which might be left in place after such removal of buildings by others.

4. Removal of Existing Structures.

a. Structures to be removed include:

1) Structures, or portions of structures, shown in the Plans to be removed;

2) Structures, or portions of structures, found within the areas requiring Clearing and Grubbing, and directed by the Engineer to be removed;

3) Structures, or portion of structures, which are necessary to be removed in order to construct new structures; and

4) All other appurtenances or obstructions which may be designated in the Contract Documents as to be included for removal under this Article.

b. Removal Requirements:

1) General:

a) Remove and dispose of all materials from existing structures required to be removed.

b) Remove the structures in a neat manner so as to leave no obstructions to any proposed new structures, construction, or to any waterways.

c) Pull, cut off, or break off pilings to the requirements of the permit or other Contract Documents, whichever requires the deepest removal, but not less than 2 feet below the finish ground line.

d) If Plans indicate channel excavation to be done by others, consider the finish ground line as the limits of such excavation.

e) For materials which are to remain the property of the Department or are to be salvaged for use in temporary structures, avoid damage to such materials, and entirely remove all bolts, nails, etc. from timbers to be so salvaged.

f) Mark structural steel members for identification as directed.

2) Removal of Steel Members With Hazardous Coatings:

a) Provide to the Engineer for approval, a copy of the "Contractor's Lead in Construction Compliance Program" from the firm actually removing and disposing of these steel members before any members are disturbed.

b) Vacuum power tool clean any coated steel member to bare metal as defined by SSPC-SP11 a minimum of 4 inches either side of any area to be heated (torch cutting, sawing, grinding, etc.) in accordance with 29 CFR 1926.354. Abrasive blasting is prohibited.

c) Provide air supplied respirators in accordance with 29 CFR 1926.62 and 29 CFR 1910.134.

c. Partial Removal of Bridges:

1) For all demolition methods, submit for review and approval of the Engineer, a demolition plan that describes the method of removal, equipment to be used, types of rebar splices or couplers, and method of straightening or cutting rebars. In addition, for hydro-demolition, describe the method for control of water or slurry runoff and measures for safe containment of concrete fragments that are thrown out by the hydro-demolition machine.

2) Where concrete is to be removed to neat lines, use concrete saws or hydro-demolition methods capable of providing a reasonably uniform cleavage face. If the equipment used will not provide a uniform cut without surface spalling, first score the outlines of the work with small trenches or grooves.

3) On concrete bridges to be partially removed and widened, remove concrete by manually or mechanically operated pavement breakers, by concrete saws, by chipping hammers, or by hydro-demolition methods. Do not use explosives.

d. Authority of U.S. Coast Guard: For structures in navigable waters, when constructing the project under authority of a U.S. Coast Guard permit, the U.S. Coast Guard may inspect and approve the work to remove any existing structures involved therein, prior to acceptance by the Department.

e. Asbestos Containing Materials (ACM) Not Identified Prior to the Work:

1) When encountering or exposing any condition indicating the presence of asbestos, cease operations immediately in the vicinity and notify the Engineer.

2) Make every effort to minimize the disturbance of the ACM. Immediately provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Provisions shall meet all applicable laws, rules or regulations covering hazardous conditions and will be in a manner commensurate with the gravity of the conditions.

3) The Engineer will direct the Prime Contractor when operations may resume in the affected area.

5. Removal of Existing Concrete Pavement.

a. Remove and dispose of existing rigid portland cement concrete pavement, sidewalk, slope pavement, ditch pavement, curb, and curb and gutter etc., where shown in the plans or ordered by the Engineer to be removed or where required because of the construction operations.

b. The work under Removal of Existing Concrete Pavement does not include the removal of retaining walls, drainage structures and flexible asphalt pavement.

6. Miscellaneous Operations.

a. Water Wells Required to be Plugged:

1) Fill or plug all water wells within the right-of-way, including areas of borrow pits and lateral ditches that are not to remain in service, in accordance with applicable Water Management District rules or the Department of Environmental Protection regulations.

2) Cut off the casing of cased wells at least 12 inches below the ground line or 12 inches below the elevation of the finished excavation surface, whichever is lower. Water wells, as referred to herein, are defined either as artesian or non-artesian, as follows:

a) An artesian well is an artificial hole in the ground from which water supplies may be obtained and which penetrates any water-bearing rock, the water in which is raised to the surface by natural flow or which rises to an elevation above the top of the water-bearing bed. Artesian wells are further defined to include all holes drilled as a source of water that penetrate any water-bearing beds that are a part of the artesian water system of Florida, as determined by representatives of the applicable Water Management District.

b) A non-artesian (water-table) well is a well in which the source of water is an unconfined aquifer. The water in a non-artesian well does not rise above the source bed.

b. Landscape Areas: When certain areas of the right-of-way, outside of the limits of construction, are shown in the plans or designated by the Engineer to be landscaped, either under the construction Contract or at a later time, remove undesirable trees, stumps, undergrowth, and vegetation, as directed, and preserve and trim natural growth and trees as directed by the Engineer.

c. Leveling Terrain: Within the areas between the limits of construction and the outer limits of clearing and grubbing, fill all holes and other depressions, and cut down all mounds and ridges. Make the area of a sufficient uniform contour so that the Department's subsequent mowing and cutting operations are not hindered by irregularity of terrain. Perform this work regardless of whether the irregularities were the result of construction operations or existed originally.

d. Mailboxes: When the Contract Documents require furnishing and installing mailboxes, permit each owner to remove the existing mailbox. Work with the Local Postmaster to develop a method of temporary mail service for the period between removal and installation of the new mailboxes. Install the mailboxes in accordance with the Design Standards.

C. Ownership of Materials.

1. Except as may be otherwise specified in the Contract Documents, the Contractor shall take ownership of all buildings, structures, appurtenances, and other materials removed by him and shall dispose of them in accordance with subarticle D below.

D. Disposal of Materials.

1. General:

a. Dispose of all debris, timber, stumps, brush, roots, rubbish, and other waste material resulting from clearing and grubbing in areas and by methods meeting the applicable requirements of all Local, State and Federal regulations.

2. Disposal of Treated Wood:

a. Treated wood, including that which comes from bridge channel fender systems, must be handled and disposed of properly during removal.

b. Treated wood should not be cut or otherwise mechanically altered in a manner that would generate dust or particles without proper respiratory and dermal protection.

c. Treated wood must be disposed of in at least a lined solid waste facility or through recycling/reuse.

d. Treated wood shall not be disposed by burning or placement in a construction and demolition (C&D) debris landfill.

e. All compensation for the cost of removal and disposal of treated wood will be included in the Cost of Removal of Existing Structures when an item for direct payment is provided in the Contract. If an item of direct payment is not provided in the Contract, the aforementioned cost is included in the cost for Clearing and Grubbing or among the other items of work in the Contract.

3. Hazardous Materials/Waste:

a. General:

1) Handle, transport and dispose of hazardous materials in accordance with all Local, State and Federal requirements including the following:

a) SSPC Guide 7

b) Federal Water Pollution Control Act, and

c) Resource Conservation and Recovery Act (RCRA).

2) Accept responsibility for the collection, sampling, classification, packaging, labeling, accumulation time, storage, manifesting, transportation, treatment and disposal of hazardous waste, both solid and liquid. Separate all solid and liquid waste and collect all liquids used at hygiene

stations and handle as hazardous materials/waste. Obtain written approval from the Engineer and required agencies for all hazardous materials/waste stabilization methods before implementation.

3) Obtain an EPA/FDEP Hazardous Waste Identification Number (EPA/FDEP ID Number) before transporting and/or disposal of any hazardous materials/waste.

4) List the Department as the generator of all hazardous materials/waste.

5) Submit the following for the Engineers' approval before transporting, treatment or disposal of any hazardous materials/waste:

a) Name, address and qualifications of the transporter,

b) Name, address and qualifications of the treatment facility,

c) Proposed treatment and/or disposal of all Hazardous Materials/Waste.

6) Transport all hazardous materials/waste in accordance with applicable 40 CFR 263 Standards. Provide a copy of all completed Hazardous Materials/Waste manifest/bills of lading to the Engineer within 21 days of each shipment.

b. Steel Members With Hazardous Coating:

1) Unless otherwise required by the Contract Documents, dispose of steel members with hazardous coating in one of the following manners:

a) Deliver the steel members and other hazardous waste to a licensed recycling or treatment facility capable of processing steel members with hazardous coating.

b) Deliver any other hazardous materials/waste to a licensed hazardous materials/waste recycling treatment facility.

2) Dismantle and/or cut steel members to meet the required dimensions of the recycling facility, treatment facility or other regulatory agency.

3) All compensation for the cost of removal and disposal of hazardous materials/waste will be included in the Cost of Removal of Existing Structures when an item for direct payment is provided in the Contract. If an item of direct payment is not provided in the Contract, the aforementioned cost is included in the cost for Clearing and Grubbing or among the other items of work in the Contract.

c. Certification of Compliance:

1) Furnish two copies of Certification of Compliance from the firm actually removing and disposing of the hazardous materials/waste stipulating, the hazardous materials/waste has been handled, transported and disposed of in accordance with this Specification.

2) The Certification of Compliance shall be attested to by a person having legal authority to bind the company.

d. Maintain all records required by this Specification and ensure they are available to the Department upon request.

E. Method of Measurement.

1. Clearing and Grubbing:

a. No Direct Payment Provided: When no item for direct payment of Clearing and Grubbing is provided by the Contract, the costs for performing all work and meeting the requirements of this Article will be included among the various scheduled items of the Contract.

b. Direct Payment Provided: When direct payment for Clearing and Grubbing is provided in the Contract, the quantity to be paid for will be the lump sum quantity.

2. One or more of the following items may appear in a contract where no direct payment item for Clearing and Grubbing is provided. Only those items with an Awarded Unit Price will be considered for direct payment. All other work of Clearing and Grubbing is included among the various scheduled items of the Contract.

a. Removal of Existing Structures: When a separate item for the Removal of Existing Structures is provided for direct payment in the Contract, the quantity to be paid for will be the lump sum quantity or actual quantities for the specific structures removed, as stipulated in the Contract Documents.

b. Removal of Existing Concrete Pavement: When a separate item for Removal of Existing Concrete Pavement is provided for direct payment in the Contract, the quantity to be paid for will be the number of square yards of existing pavement of the types listed in subarticle B.5 herein, acceptably removed and disposed of, as specified. The quantity will be determined by actual measurement along the surface of the pavement before its removal. Measurements for appurtenances which have irregular surface configurations, such as curb and gutter, steps, and ditch pavement, will be the area as projected to an approximate horizontal plane. Where the removal of pavement areas is necessary only for the construction of box culverts, pipe culverts, storm sewers, french drains, inlets, manholes, etc., these areas will not be included in the measurements.

c. Removal of Trees: When separate items for the Removal of Trees are provided for direct payment in the Contract, trees that are greater than 6 inches in diameter, will be paid on a per each basis by actual count by the Engineer of such trees under the appropriate item provided in the Contract. The diameter of a tree shall be obtained by measuring its circumference at 4.5 feet above the ground using a flexible tape measure and dividing the circumference by 3.14. If the tree is growing on a slope, the

circumference is measured at 4.5 feet from the center of the slope. If the tree begins to branch below 4.5 feet, measure at the smallest circumference below the first branch.

d. Plugging Water Wells: When a separate item for Plugging of Water Wells is provided for direct payment in the Contract, the quantity to be paid for will be the number of water wells plugged, for each type of well (artesian or non-artesian).

e. Mailboxes: When a separate item is provided in the Contract for furnishing and installing mailboxes, the quantity to be paid for will be the number of mailboxes acceptably furnished and installed.

f. Delivery of Salvageable Material to the Department: When a separate item is provided in the Contract for the delivery of salvageable material to the Department, the quantity to be paid for will be the Lump Sum quantity for delivery of salvageable materials to the Department as indicated in the Plans or as directed by the Engineer.

F. Basis of Payment.

1. Clearing and Grubbing:

a. No Direct Payment Provided: When direct payment for Clearing and Grubbing is not provided in the Contract, the cost of any work of clearing and grubbing necessary for the proper construction of the Project and meeting all requirements of this Article, is included in the Contract price for the structure or other item of work for which such clearing and grubbing is required.

b. Direct Payment Provided:

1) Price and payment will be full compensation for all clearing and grubbing indicated or required for the construction of the entire Project, including all necessary hauling, furnishing equipment, equipment operation, furnishing any areas required for disposal of debris, leveling of terrain and the landscaping work of trimming, etc., as specified herein, except for any areas designated to be paid for separately or to be specifically included in the costs of other work under the Contract.

2) Unless otherwise provided by the Contract, price and payment will be full compensation for all work required by this Article including Removal of Existing Structures, Removal of Existing Concrete Pavement, Removal of Trees, Plugging of Water Wells, Mailboxes, and Delivery of Salvageable Material to the Department.

3) Where construction easements are specified in the Plans and the limits of clearing and grubbing for such easements are dependent upon the final construction requirements, no adjustment will be made in the lump sum price and payment, either over or under, for variations from the limits of the easement defined on the Plans.

c. The Contractor shall include the cost of all clearing and grubbing which might be necessary in pits or areas from which base material is obtained in the Contract price for the base in which such material is used.

d. The clearing and grubbing of areas for obtaining stabilizing materials, where required only for the purpose of obtaining materials for stabilizing, will not be paid for separately.

2. Removal of Existing Structures:

a. Price and payment will be full compensation for all work of removal and disposal of the designated structures.

b. When direct payment for the removal of existing structures is not provided in the Contract, the cost of removing all structures is included in the Contract price for Clearing and Grubbing or, if no item of Clearing and Grubbing is included, in the compensation for the other items covering the new structure being constructed.

3. Removal of Existing Concrete Pavement:

a. Price and payment will be full compensation for performing and completing all the work of removal and satisfactory disposal including any saw cutting required.

b. When direct payment for the removal of existing concrete pavement is not provided in the Contract and no applicable item of excavation or embankment covering such work is included in the Contract, the Contractor shall include the costs of this work in the Contract price for the item of Clearing and Grubbing or, if no item of Clearing and Grubbing is included in the Contract, in any work, pipe or other structure for which the concrete pavement removal is required.

4. Removal of Trees:

a. Price and payment will be full compensation for complete removal and disposal of each tree counted by the Engineer pursuant to these specifications.

b. When direct payment for the removal of trees is not provided in the Contract, the cost of removing all trees is included in the Contract price for Clearing and Grubbing or, if no item of Clearing and Grubbing is included in the Contract, in the compensation for all other items in the Contract.

5. Plugging Water Wells:

a. Price and payment will be full compensation for each type of well acceptably plugged.

b. When direct payment for plugging water wells is not provided in the Contract, the cost plugging water wells is included in the Contract price for Clearing and Grubbing or, if no item of Clearing and Grubbing is included in the Contract, in the compensation for all other items in the Contract.

6. Mailboxes:

a. Price and payment will be full compensation for all work and materials required, including supports and numbers.

b. When direct payment for mailboxes is not provided in the Contract, the cost for all work and materials required, including supports and numbers, is included in the Contract price for Clearing and Grubbing or, if no item of Clearing and Grubbing is included in the

Contract, in the compensation for all other items in the Contract.

7. Delivery of Salvageable Material to the Department:

a. Price and payment will be full compensation for all work required for delivery of the materials to the Department.

b. When the Contract does not provide direct payment for the Delivery of Salvageable Material that is to be delivered to the County, the cost of Delivery of Salvageable Material is included in the Contract price for Clearing and Grubbing or, where no item for Clearing and Grubbing is included in the Contract, in the compensation for all other items in the Contract.

8. Payment Items: Payment will be made under:

Item No.	Description	Unit
110- 1-1B	Clearing and Grubbing	LS

Exhibit 15

Signal Intersection Operation Modes (Free - Flash Only)

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
2023	W Dixie Hwy & NE 172 St	FREE
2026	NE 6 Av / NE 171 St / NE 172 St	FREE/FLASH
2030	NW 2 Av / NW 49 St / NW 50 St	FREE/FLASH
2031	NW 2 Av / NW 61 St / NW 62 St	FREE/FLASH
2039	NW 46 St / NW 12 Av / NW 13 Av	FREE/FLASH
2040	NW 50 St / NW 12 Av / NW 13 Av	FREE/FLASH
2043	NW 71 St / NW 13 Av / NW 14 Av	FREE/FLASH
2044	NW 75 St / NW 4 Ct / NW 5 Av	FREE
2067	NW 10 Av & NW 46 St	FREE
2133	Red Rd / SW 4 St / SW 5 St	FREE
2155	SW 12 Av / SW 14 St / SW 15 St	FREE/FLASH
2157	SW 13 Av / SW 19 St / SW 19 Ter	FREE/FLASH
2161	SW 22 Av / SW 25 St / SW 26 St	FREE/FLASH
2176	Bird Av & SW 32 Av	FREE
2207	Grand Av & Main Hwy & McFarlane Rd	FREE
2261	Broadway & US-1	FREE
2269	NW 2 Av / NW 30 St / NW 31 St	FREE/FLASH
2274	NW 10 Av / NW 29 Ter / NW 30 St	FREE/FLASH
2280	NW 1 Pl / NW 18 St / NW 19 St	FREE/FLASH
2292	NW 23 St / NW 18 Av / NW 19 Av	FREE/FLASH
2293	NW 28 St / NW 18 Av / NW 19 Av	FREE/FLASH
2357	NW 8 St Rd & NW 11 St	FREE/FLASH
2372	NW 1 Pl & NW 14 St	FREE/FLASH
2397	NW 3 Av & NW 20 St	FREE/FLASH
2421	NW 5 Av & NW 29 St	FREE/FLASH
2446	NW 22 Av / NW 83 St / NW 83 Ter	FREE/FLASH
2451	NW 32 Av / NW 34 St / NW 35 St	FREE
2455	NW 46 St / NW 23 Av / NW 24 Av	FREE/FLASH
2456	NW 46 St / NW 29 Av / NW 30 Av	FREE/FLASH
2461	NW 71 St / NW 18 Av / NW 19 Av	FREE
2464	NW 87 St / NW 33 Ct / NW 34 Av	FREE/FLASH
2467	NW 103 St / NW 10 Av / NW 11 Av	FREE/FLASH
2477	Memorial Hwy & N Miami Av	FREE
2528	Griffing Blvd & NE 6 Av & NE 113 St	FREE
2532	NE 7 Av / NE 131 St / NE 132 St	FREE
2534	Bayshore Dr N & N Miami Blvd & Broad Cswy	FREE
2560	NE 103 St / NE 5 Av / NE 6 Av	FREE
2565	NE 10 Av & NE 96 St	FREE
2573	Granada Blvd / Benevento Av / Pisano Av	FREE/FLASH
2574	Grand Av / Jefferson St / Lincoln Dr	FREE/FLASH
2579	University Dr / Campo Sano Av / Pisano Av	FREE
2588	Alhambra Cir & Granada Blvd & Majorca Av	FREE

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
2704	Drexel Av & 14 St	FREE
2706	Drexel Av & 15 St	FREE
2707	Drexel Av & 16 St	FREE
2708	Drexel Av & Lincoln Rd	FREE
2709	Euclid Av & 11 St	FREE
2710	Euclid Av & 15 St	FREE/FLASH
2718	Crespi Blvd & Hawthorne Av	FREE
2741	Meridian Av & 6 St	FREE
2742	Meridian Av & 8 St	FREE
2743	Meridian Av & 11 St	FREE
2744	Meridian Av & 14 Pl	FREE
2745	Meridian Av & 15 St	FREE
2767	Pennsylvania Av & 11 St	FREE
2768	Pennsylvania Av & 14 St	FREE
2774	Pine Tree Dr & 47 St	FREE
2775	Pine Tree Dr & 51 St & La Gorce Dr	FREE
2816	77 St / Tatum Wtrwy Dr / Dickens Av	FREE/FLASH
2826	LeJeune Rd / E 6 Pl / E 7 St	FREE
2827	LeJeune Rd / E 11 Pl / E 12 St	FREE
2828	E 4 Av / E 33 St / E 34 St	FREE
2831	Palm Av / 45 St / 45 Pl	FREE
2832	Palm Av / 63 St / 64 St	FREE/FLASH
2838	E 41 St / E 6 Av / E 7 Av	FREE
2888	NW 22 Av / NW 152 Ter / NW 153 St	FREE
2903	Douglas Rd & NW 46 St	FREE
2928	Ludlam Rd / SW 60 St / SW 62 St	FREE/FLASH
2929	SW 74 Av / SW 10 St / SW 11 St	FREE
2932	SW 82 Av / SW 35 St / SW 36 St	FREE
2937	SW 92 Av / SW 52 Ter / SW 53 St	FREE/FLASH
2938	Franjo Rd & SW 184 St	FREE
2971	Ali Baba Av / Codadad St / Sinbad Av	FREE/FLASH
2975	Ali Baba Av & Opa-Locka Blvd	FREE/FLASH
2978	Fisherman St & Opa-locka Blvd	FREE
2984	SW 328 St / SW 181 Av / SW 182 Av	FREE/FLASH
2990	SW 248 St / SW 161 Av / SW 162 Av	FREE/FLASH
2996	Ludlam Rd / SW 73 St / SW 74 St	FREE/FLASH
3008	SW 16 St / SW 59 Av / SW 60 Av	FREE
3009	SW 62 Av & SW 16 St	FREE
3017	Curtiss Pkwy / NW 38 St / NW 40 St	FREE/FLASH
3029	SW 182 Av & SW 324 St	FREE
3045	SW 296 St / SW 169 Av / SW 170 Av	FREE/FLASH
3064	SW 124 St / SW 73 Av / SW 74 Av	FREE/FLASH

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
3086	Opa-locka Blvd / Perviz Av / Sinbad Av	FREE/FLASH
3088	NW 131 St / NW 12 Av / NW 13 Av	FREE/FLASH
3091	SW 97 Av / SW 12 St / SW 14 St	FREE
3103	SW 187 Av / SW 306 St / SW 306 Ter	FREE/FLASH
3126	SW 97 Av / SW 38 St / SW 39 St	FREE
3134	SW 102 Av / SW 53 St / Miller Dr	FREE/FLASH
3136	NE 22 Av / NE 187 St / NE 191 St	FREE
3153	Flagler St W @ W 5900 Blk	FREE
3165	Sunset Dr / SW 98 Ct / SW 99 Av	FREE/FLASH
3182	NW 10 Av / NW 67 St / NW 68 St	FREE
3196	SW 16 St / SW 82 Pl / SW 83 Av	FREE
3202	NE 18 Av / NE 160 St / NE 161 St	FREE
3205	NW 22 Av / NW 187 St / NW 188 St	FREE
3221	NW 12 Av / NW 194 St / NW 195 St	FREE/FLASH
3223	NE 12 Av / NE 146 St / NE 147 St	FREE
3248	NE 6 Av & NE 159 St	FREE
3254	NW 12 Av / NW 29 St / NW 30 St	FREE/FLASH
3263	SW 48 St / SW 58 Av / SW 59 Av	FREE
3266	SW 120 St / SW 72 Av / SW 73 Av	FREE/FLASH
3267	SW 104 Av & SW 48 St	FREE
3279	E 10 Av & E 41 St	FREE
3281	NW 22 Av / NW 26 St / NW 27 St	FREE
3299	NW 12 Av / NW 114 St / NW 115 St	FREE/FLASH
3304	SW 48 St / SW 93 Ct / SW 94 Av	FREE/FLASH
3305	W 65 St / W 5 Av / W 5 Pl	FREE/FLASH
3320	Collins Av & The Strand	FREE
3338	NW 10 Av & NW 58 St	FREE
3339	NW 46 St / NW 19 Av / NW 21 Av	FREE/FLASH
3348	Homestead Av / Jessamine St / Kumquat St	FREE/FLASH
3350	SW 187 Av / SW 326 St / SW 327 St	FREE/FLASH
3364	NW 175 St / NW 29 Ct / NW 29 Pl	FREE/FLASH
3416	Franjo Rd / SW 184 St / SW 185 Ter	FREE
3419	SW 112 Av / SW 176 St / SW 177 St	FREE
3457	NW 135 St / NW 11 Av / NW 12 Av	FREE
3458	Ahmad St & Sharazad Blvd	FREE/FLASH
3463	SW 112 Av & SW 95 St	FREE
3477	LeJeune Rd & NW 191 St	FREE/FLASH
3504	NE 15 Av / NE 178 St / NE 179 St	FREE
3521	North River Dr & NW 14 Av & NW 12 St	FREE
3543	SW 182 Av & SW 340 St	FREE
3549	SW 167 Av & SW 288 St	FREE
3569	SW 182 Av & SW 328 St	FREE

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
3579	SW 97 Av & SW 48 St	FREE/FLASH
3603	NW 32 Av & NW 28 St	FREE
3635	NE 4 Ct & NE 71 St	FREE
3641	Homestead Av & Quail Roost Dr	FREE
3657	SR- 826 EB & NW 17 Av	FREE
3686	NW 207 St / NW 32 Av / NW 33 Av	FREE/FLASH
3701	SW 127 Av / SW 30 St / SW 31 St	FREE/FLASH
3708	W 16 Av / W 74 St / W 76 St	FREE/FLASH
3717	NE 12 Av & NE 211 St	FREE
3728	SW 102 Av & SW 112 St	FREE
3750	E 6 Av & E 25 St	FREE
3764	Ludlam Rd & NW 32 St	FREE/FLASH
3791	SW 82 Av & SW 16 St	FREE/FLASH
3793	Grand Av & SW 32 Av	FREE
3824	SE 9 Ct & SE 8 St	FREE/FLASH
3862	W 23 St / W 5 Av / W 5 Ct	FREE/FLASH
3863	Park St & Westward Dr	FREE/FLASH
3899	Hawthorne Av & 77 St	FREE
3912	Bel-view Dr & Marlin Rd	FREE
3935	Oak Av & Virginia St	FREE
3936	SW 92 Av & SW 32 St	FREE/FLASH
3944	SW 99 Ct & SW 84 St	FREE
3951	Apache St & Westward Dr	FREE/FLASH
3968	Caribbean Blvd & Franjo Rd	FREE
3986	Crandon Blvd @ The Circle	FREE/FLASH
4001	NW 7 Av @ NW 16000 Blk	FREE
4006	W 21 St @ W 250 Blk	FREE
4055	NW 75 St / NW 17 Av / NW 19 Av	FREE
4056	SR- 826 EB & NW 27 Av	FREE
4106	W 16 Av & W 76 St	FREE/FLASH
4110	NW 4 Av & NW 7 Av Ext & NW 171 St	FREE
4115	SW 102 Av & SW 48 St	FREE
4117	SW 92 Av & SW 48 St	FREE
4143	Tatum Wtrwy Dr / 79 St / 80 St	FREE
4153	Alton Rd / Delaware Av / Lakeview Dr	FREE
4177	SW 268 St / SW 139 Av / SW 142 Av	FREE/FLASH
4179	Collins Av @ 10500 Blk	FREE
4182	SW 97 Av & SW 104 St	FREE/FLASH
4194	Chase Av / 41 St / 44 St	FREE
4215	NE 16 Av / NE 140 St / NE 141 St	FREE
4227	W 8 Av @ W 4800 Blk	FREE
4240	SW 117 Av & SW 177 Ter	FREE/FLASH

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
4254	SW 187 Av & SW 312 St	FREE/FLASH
4263	SW 102 Av & SW 124 St	FREE/FLASH
4290	NW 27 Av @ NW 18700 Blk	FREE
4299	Aventura Blvd & NE 29 Pl	FREE/FLASH
4309	Tigertail Av & SW 17 Av	FREE/FLASH
4313	SW 92 Av & SW 16 St	FREE/FLASH
4314	N Miami Blvd & Sans Souci Blvd	FREE/FLASH
4315	Milam Dairy Rd & NW 58 St	FREE/FLASH
4318	NE 18 Av & NE 191 St	FREE
4326	NW 175 St / NW 19 Av / NW 20 Av	FREE
4328	Krome Av & SW 296 St	FREE/FLASH
4330	SW 127 Av & SW 268 St	FREE
4336	NW 13 Ct & NW 14 St	FREE
4340	Caribbean Blvd & SW 89 Rd	FREE/FLASH
4348	NW 58 St / NW 13 Av / NW 14 Av	FREE
4353	SW 142 Av / SW 78 St / SW 80 St	FREE
4357	SW 152 Av & SW 296 St	FREE/FLASH
4365	NW 17 Av & NW 175 St	FREE
4366	SW 62 Av & SW 80 St	FREE/FLASH
4367	NE 145 St / NE 6 Av / NE 7 Ct	FREE
4373	Colonial Dr & SW 107 Av	FREE
4379	Richmond Dr / SW 88 Av / SW 88 Ct	FREE
4382	NE 17 Av & NE 164 St	FREE
4386	NW 191 St / NW 37 Ct / NW 39 Av	FREE/FLASH
4389	Ponce De Leon Blvd & San Amaro Dr	FREE/FLASH
4419	Old Cutler Rd / Campana Av / SW 105 St	FREE
4424	Ocean Dr & 10 St	FREE
4471	NE 23 Av & NE 207 St	FREE/FLASH
4472	SW 109 Av & SW 128 St	FREE/FLASH
4488	SW 122 Av / SW 105 St / SW 105 Ter	FREE/FLASH
4503	Perimeter Rd & NW 62 Av	FREE
4506	Coral Reef Dr & SW 82 Av	FREE
4537	NE 2 Av & NE 215 St	FREE
4547	NW 62 St / NW 27 Av / NW 29 Av	FREE/FLASH
4553	SW 47 St / SW 129 Ct / SW 130 Av	FREE
4572	NW 7 Av & NW 215 St	FREE
4585	NW 30 Av & NW 11 St	FREE/FLASH
4586	SW 132 Av & SW 47 St	FREE
4612	NW 12 Av & NW 175 St	FREE
4623	NW 169 St & NW 75 Pl & NW 77 Ct	FREE
4648	Aventura Blvd & Country Club Dr W	FREE/FLASH
4649	Ocean Dr & 5 St	FREE

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
4656	NE 2 Av / NE 204 St / NE 202 Ter	FREE
4677	SW 62 Av & SW 70 St	FREE/FLASH
4684	SW 70 Av & SW 80 St	FREE/FLASH
4686	SW 59 Pl & SW 70 St	FREE
4707	NW 32 Av & NW 33 St	FREE
4736	Collins Av & Haulover Park	FREE/FLASH
4738	E 6 Av & E 32 St	FREE
4755	Mitchell Dr & SW 92 Av	FREE
4756	W Dixie Hwy & NE 22 Av & NE 167 St	FREE
4769	NE 12 Av & NE 149 St	FREE
4771	NE 34 Av & NE 207 St	FREE
4783	Krome Av & SW 184 St	FREE/FLASH
4784	Krome Av & SW 200 St	FREE/FLASH
4785	Krome Av & SW 248 St	FREE
4787	Krome Av & SW 216 St	FREE/FLASH
4788	Krome Av & SW 232 St	FREE/FLASH
4789	Krome Av & SW 264 St	FREE/FLASH
4790	Krome Av & SW 288 St	FREE/FLASH
4827	Delaware Pkwy & NW 17 St	FREE/FLASH
4828	NW 47 Av & NW 199 St	FREE
4848	Ludlam Rd & NW 199 St	FREE/FLASH
4857	NW 23 Av & NW 28 St	FREE
4858	SW 152 Av & SW 328 St	FREE
4861	Kendale Lakes Blvd & SW 142 Av	FREE
4862	NW 12 Av & NW 111 St	FREE
4871	SW 127 Av & SW 96 St	FREE/FLASH
4879	Killian Dr & SW 72 Av	FREE/FLASH
4890	NW 215 St @ NW 1700 Blk	FREE
4903	NW 69 Av & NW 74 St	FREE
4904	SW 167 Av & SW 328 St	FREE
4905	NE 29 Pl & NE 203 St	FREE
4914	Country Club Dr N & NE 34 Av	FREE
4916	SW 162 Av & SW 328 St	FREE
4921	NW 7 St / NW 82 Av / NW 84 Av	FREE/FLASH
4966	NW 215 St & NW 13 Ct	FREE
4983	SW 102 Av & SW 128 St	FREE
4990	SR- 826 @ 300 Blk	FREE
5023	Caribbean Blvd & Galloway Rd	FREE/FLASH
5035	SW 132 Av & SW 18 St	FREE/FLASH
5045	SW 157 Av & SW 307 St	FREE/FLASH
5046	Galloway Rd & SW 184 St	FREE
5050	SW 187 Av & SW 320 St	FREE

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
5110	NW 24 Av & NW 87 St	FREE/FLASH
5118	SW 147 Av & SW 80 St	FREE
5119	SW 74 Av & SW 16 St	FREE
5129	Sunset Dr & Yumuri St	FREE/FLASH
5143	Old Cutler Rd @ SW 13500 Blk	FREE
5150	SW 157 Av & SW 296 St	FREE
5151	Colonial Dr & SW 112 Av	FREE
5152	SW 117 Av @ SW 2000 Blk	FREE/FLASH
5159	San Simeon Way & NE 215 St	FREE
5165	Curtiss Pkwy NB / Cross St / Reinette Dr	FREE/FLASH
5173	Sunset Dr / SW 123 Av / SW 125 Av	FREE/FLASH
5181	SW 132 Av & SW 79 St	FREE
5184	Highland Lakes Blvd & NE 199 St	FREE
5185	N Miami Av & N 111 St	FREE
5186	N Miami Av & N 191 St	FREE
5187	NW 14 Av & NW 17 St	FREE
5190	Curtiss Pkwy SB / Cross St / Reinette Dr	FREE/FLASH
5191	SW 118 Av & SW 2 St	FREE
5195	SW 117 Av @ SW 2300 Blk	FREE/FLASH
5197	Richmond Dr & SW 117 Av	FREE/FLASH
5208	NW 82 Av & NW 176 St	FREE
5216	SW 74 Av & SW 12 St	FREE
5220	Miami Lakes Dr W & Miami Lkwy S	FREE/FLASH
5244	W Dixie Hwy & NE 26 Av & NE 193 St	FREE
5254	NW 32 Av & NW 151 St	FREE
5258	Fontainebleau Blvd & Park Blvd	FREE/FLASH
5266	Ludlam Rd & SW 4 St	FREE
5325	Hammocks Blvd @ SW 10000 Blk	FREE
5326	SW 92 Av / Flagler St W / SW 4 St	FREE
5383	SW 82 Av & SW 32 St	FREE
5384	Sunset Dr & SW 52 Av	FREE/FLASH
5385	SW 70 Av & SW 85 St	FREE/FLASH
5386	NW 95 St / NW 9 Av / NW 10 Av	FREE
5388	NW 82 Av & NW 7 St	FREE
5389	SW 152 Av & SW 80 St	FREE
5392	SW 122 Av & SW 112 St	FREE/FLASH
5393	W 2 Av & W 29 St	FREE/FLASH
5398	SW 147 Av & SW 96 St	FREE
5404	NW 13 Av & NW 159 St	FREE
5407	SW 187 Av & SW 328 St	FREE
5411	SW 109 Av & SW 4 St	FREE/FLASH
5419	SW 182 Av & SW 304 St	FREE

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
5420	SW 187 Av & SW 304 St	FREE
5431	SW 146 Av & SW 96 St	FREE
5451	Ludlam Rd & NW 22 St	FREE
5452	NW 68 Av & NW 22 St	FREE/FLASH
5459	SW 144 Av / SW 289 Ter / SW 291 St	FREE
5477	SR- 821 SB Off & SW 137 Av	FREE/FLASH
5487	SW 117 Av @ SW 3700 Blk	FREE
5491	SW 72 Av & SW 104 St	FREE
5499	SW 97 Av & SW 64 St	FREE/FLASH
5501	NW 82 Av & NW 170 St	FREE/FLASH
5508	Country Club Dr W & SR- 856 WB Off	FREE
5511	SW 122 Av & SW 2 St	FREE/FLASH
5543	SW 344 St @ SW 10100 Blk	FREE/FLASH
5544	SW 152 Av / SW 66 St / SW 67 St	FREE
5546	Pennsylvania Av / Espanola Way / 14 Pl	FREE/FLASH
5550	NW 7 St / NW 51 Av / NW 53 Av	FREE
5562	Richmond Dr & S Dade Bswy	FREE/FLASH
5563	Banyan St & S Dade Bswy	FREE/FLASH
5564	Hibiscus St & S Dade Bswy	FREE/FLASH
5565	S Dade Bswy & SW 184 St	FREE/FLASH
5566	Quail Roost Dr & S Dade Bswy	FREE/FLASH
5567	Marlin Rd & S Dade Bswy	FREE/FLASH
5587	NW 43 Pl & NW 14 St	FREE
5658	SW 132 Av & SW 127 Dr	FREE
5659	SW 92 Av & SW 12 St	FREE
5664	NE 29 Av & NE 190 St	FREE
5706	NW 22 St @ NW 6300 Blk	FREE
5723	NW 60 Av / NW 142 St / Miami Lakes Dr E	FREE
5726	Kendall Dr & Krome Av	FREE
5728	NW 102 Av & NW 52 St	FREE
5736	Country Club Dr W & Spoke Rd	FREE
5745	Park Blvd & NW 84 Av	FREE
5752	Coral Reef Dr @ SW 13300 Blk	FREE
5753	Country Club Dr E & Yacht Club Way	FREE
5755	Cottonwood Cir & SW 152 Av	FREE
5770	Hammocks Blvd & SW 96 St	FREE
5774	Miami Gardens Dr @ NW 7700 Blk	FREE
5783	SW 80 St / SW 155 Av / SW 156 Av	FREE
5798	SW 77 Av & SW 104 St	FREE/FLASH
5806	Park Blvd & NW 82 Av	FREE
5811	Galloway Rd & SW 216 St	FREE
5877	Bus Rd & Perimeter Rd	FREE

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
5903	E 4 Av & E 17 St	FREE/FLASH
5915	W 18 Av & W 60 St	FREE/FLASH
5933	NW 132 Av & NW 6 St	FREE/FLASH
5949	Miami Lakes Dr W & Miami Lkwy N	FREE
5951	Abigail Rd & Spoke Rd	FREE
5954	NW 112 Av & NW 17 St	FREE
5957	W 24 Pl & W 60 St	FREE/FLASH
5958	Colonial Dr & SW 102 Av	FREE
5964	SW 147 Av & SW 184 St	FREE/FLASH
5969	Palm Av & 53 Ter	FREE/FLASH
5970	NW 18 Av & NW 28 St	FREE/FLASH
5971	SW 157 Av @ SW 31000 Blk	FREE/FLASH
5972	SW 152 Av & SW 64 St	FREE/FLASH
5973	E 4 Av & E 56 St	FREE/FLASH
5975	Miami Lakes Dr W & NW 87 Av	FREE
5979	Douglas-LeJeune Conn @ E 6300 Blk	FREE/FLASH
5981	NW 47 Pl & NW 199 St	FREE
5987	NW 79 St @ NW 1300 Blk	FREE
5993	W 14 Av & W 60 St	FREE/FLASH
5995	Country Club Dr W & NE 190 St	FREE
5996	NE 30 Av & NE 207 St	FREE
6025	Galloway Rd @ SW 21500 Blk	FREE
6033	Anastasia Av & Segovia St	FREE
6047	SW 152 Av & SW 96 St	FREE/FLASH
6057	Ludlam Rd & NW 34 St	FREE/FLASH
6088	NW 102 Rd & NW 116 Way	FREE/FLASH
6090	NW 27 Av @ NW 15200 Blk	FREE
6111	NW 79 Pl & NW 77 St	FREE/FLASH
6115	SW 127 Av & SW 80 St	FREE
6118	SW 117 Av @ SW 16000 Blk	FREE/FLASH
6126	Carver Dr & Lincoln Blvd	FREE/FLASH
6130	McLaughlin Dr & MIA Service Rd N	FREE
6131	McLaughlin Dr & NW 20 St	FREE
6144	Old Dixie Hwy & SW 146 Ct & S Dade Bswy	FREE
6156	SW 32 Av & SW 27 St	FREE/FLASH
6157	W 24 Av & W 76 St	FREE/FLASH
6160	NW 97 Av & NW 52 St	FREE/FLASH
6312	NE 183 St & NE 31 Ct & NE 31 Av	FREE
6313	NE 34 Av & NE 213 St	FREE
6314	NW 107 Av & NW 52 St	FREE/FLASH
6322	SW 112 Av & SW 107 St	FREE
6344	Ocean Dr & 11 St	FREE

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
6345	Ocean Dr & 7 St	FREE
6349	SW 127 Av @ SW 8600 Blk	FREE
6370	S Dade Bswy & SW 336 St	FREE/FLASH
6371	S Dade Bswy & SW 328 St	FREE/FLASH
6372	S Dade Bswy & SW 324 St	FREE/FLASH
6380	NW 14 Av & NW 28 St	FREE/FLASH
6382	Douglas Rd & NW 25 St	FREE
6403	NW 38 Ct & NW 25 St	FREE
6404	NW 38 Ct & NW 21 St	FREE
6416	Segovia St & Valencia Av	FREE
6418	SW 70 Av & SW 16 St	FREE
6423	SW 157 Av & SW 96 St	FREE
6436	W 8 Av & W 77 St	FREE/FLASH
6447	SW 137 Av & SW 312 St	FREE/FLASH
6466	Atlantic Way & S Cruise Blvd	FREE
6472	N Miami Av / N 112 St / N 114 St	FREE
6487	Galloway Rd & SW 212 St	FREE
6494	Hammocks Blvd & SW 112 St	FREE
6501	NW 107 Av & NW 106 St	FREE/FLASH
6502	NW 127 Av & NW 17 St	FREE/FLASH
6504	NE 28 Ct & NE 187 St	FREE
6507	Quail Roost Dr & SW 137 Av	FREE/FLASH
6512	SW 162 Av & SW 344 St	FREE/FLASH
6543	S Miami Av SB & S 3 St	FREE
6545	Krome Av & Okeechobee Rd SB	FREE/FLASH
6561	SW 172 Av & SW 328 St	FREE/FLASH
6562	SW 127 Av & SW 108 St	FREE/FLASH
6573	Harding Av & 69 St	FREE
6574	NE 5 St / NE 1 Av / NE 2 Av	FREE
6584	NE 1 Av / NE 3 St / NE 5 St	FREE
6587	NW 127 Av & NW 7 Ter	FREE/FLASH
6588	SR- 821 & NW 114 Av & NW 74 St	FREE/FLASH
6592	Miami Gardens Dr & NE 28 Ct	FREE
6623	Coral Reef Dr & Galloway Rd	FREE/FLASH
6624	NW 52 Av & NW 199 St	FREE
6625	SW 147 Av & SW 160 St	FREE
6642	NW 2 Av & NW 67 St	FREE/FLASH
6646	SW 134 Av & SW 248 St	FREE/FLASH
6647	NW 75 Pl / NW 183 Ln / Miami Gardens Dr	FREE/FLASH
6650	NW 114 Av & NW 50 St	FREE/FLASH
6654	NW 16 St / NW 12 Av / NW 13 Av	FREE
6659	SW 122 Av & SW 128 St	FREE/FLASH

Miami-Dade County
Signals Operating Free Mode 24/7 (264)
Signals Operating Free / Flash (194)

Asset No.	Location	Mode
6665	NW 87 Av & NW 66 St	FREE/FLASH
6667	NW 79 Av & NW 7 St	FREE/FLASH
6690	SW 344 St / SW 183 Av / SW 184 Av	FREE
6694	SW 127 Av & SW 248 St	FREE
6695	NW 82 Av & NW 162 St	FREE/FLASH
6698	N Meadow Lake Dr & SW 152 Av	FREE
6701	NE 29 Av & NE 188 St	FREE
6733	NW 42 Ct & NW 18 St	FREE/FLASH
6777	SW 167 Av & SW 344 St	FREE
6792	Curtis Rd & LeJeune Rd	FREE/FLASH
6797	Bird Rd & SW 157 Av	FREE
6801	SW 137 Av & SW 328 St	FREE/FLASH
6809	SW 137 Av & SW 296 St	FREE/FLASH
6858	NW 14 Av & NW 29 St	FREE/FLASH
6861	NW 87 Av & NW 178 St	FREE
6865	NW 97 Av & NW 17 St	FREE/FLASH
6869	NW 112 Av & NW 86 St	FREE/FLASH
6875	SW 149 Av & SW 80 St	FREE
6885	NW 33 St @ NW 9300 Blk	FREE/FLASH
6889	MIA Service Rd W & NW 20 St	FREE/FLASH
6891	SW 162 Av & SW 47 St	FREE
6893	Europe Way & S Cruise Blvd	FREE
6897	NW 17 Av / NW 66 St / NW 67 St	FREE
6902	South River Dr & NW 74 Av	FREE
6909	SW 162 Av & SW 64 St	FREE/FLASH
6919	Alton Rd & 2 St	FREE
6920	Krome Av & SW 136 St	FREE
6928	Douglas Rd & NW 28 St	FREE
6930	NW 39 Av & NW 25 St	FREE
6931	NW 32 Av @ NW 7600 Blk	FREE
6949	Kendall Dr & SW 68 Ct	FREE/FLASH
6956	Kendall Dr & SW 172 Av	FREE
6965	SW 92 Av & SW 216 St	FREE
6980	SW 147 Av & SW 10 St	FREE/FLASH
6981	SW 144 Av & SW 136 St	FREE
6982	Red Rd & SW 104 St	FREE
7606	NW 22 Av & NW 50 St	FREE
7607	NW 19 Ave & NW 28 ST	FREE

Exhibit 16

Exhibit 16 Miami-Dade County
Traffic Signal Controller Functions

Miami-Dade County Traffic Signal Controller Functions

1. Introduction

1.1. Purpose

This document provides an overview of the required Miami-Dade County traffic signal controller functions. It outlines the expected operational behaviors and the capabilities the controllers must have to support these operations. These functionalities ensure that the controllers can deliver the desired performance and integrate effectively with Miami-Dade County's advanced traffic management system.

2. Functions Attributes and Compliance

2.1. The programming of Miami-Dade County traffic signal controller functions must be designed for ease of replication across multiple locations and must not be limited to single, site-specific configurations, ensuring consistency and scalability within the traffic management system.

2.2. The functions must be programmable in accordance with the configurations of the Miami-Dade County MD-552 and MD-660 series controller cabinets, while still maintaining flexibility to operate within other 170-type cabinets, including Caltrans model cabinets and Advanced Transportation Controller cabinets (ATC 5301 v02.02). This ensures that the functions are adaptable and compatible across a range of cabinet types within the traffic management infrastructure.

2.3. The functions, when programmed, must meet the minimum standards and requirements of the Manual on Uniform Traffic Control Devices (MUTCD), Miami-Dade County and the Florida Department of Transportation (FDOT). Any updates or changes to standards and requirements must be reflected in the function programming and documentation.

2.4. The functions must not create unsafe conditions for vehicles and pedestrians (e.g., yellow trap, incorrect phase sequences, conflicting signal indications, and others).

2.5. All functions described herein must be programmed directly within the traffic signal controller, without the use of proprietary objects, protocols, third-party software, or external equipment.

2.6. The functions must not require any modifications to the Input and Output assignments (I/O map) and pin assignment of Miami-Dade County.

2.7. The programming of the functions must be carefully executed to ensure that no unintended changes occur to other existing functions within the controller. Any updates or modifications must be isolated to the specified target functions, avoiding any inadvertent impacts on other controller operations. Verification testing must be performed to confirm that the updated functions operate as intended and that all other controller functions remain unaffected and continue to perform as expected.

2.8. Each function must undergo thorough testing to verify that it operates safely under all expected operational scenarios, including, but not limited to, abnormal scenarios such as power interruptions and surges, communication failures, or controller restarts.

3. Documentation

3.1. Each function must include comprehensive documentation covering, but not limited to:

3.1.1. A detailed description of the function's operation.

3.1.2. Clear and detailed instructions of the programming steps, including the steps through the controller front panel and the central software.

3.1.3. Safety, operational, and programming guidance and precautions on potential issues to avoid during the programming process.

3.1.4. Updates to the programming steps that may be required due to changes from controller firmware upgrades.

3.1.5. All documentation must be combined into a single document that will serve as a programming guideline. The document must include a revision tracker to log all revisions.

4. Traffic Signal Controller Functions

This section lists the required functions that Miami-Dade County Traffic Signal Controllers must support at the time of this document development. Additional functions may be added during the duration of the project. Each function is detailed in terms of its operational behavior, required controller capabilities, and specific safety considerations.

4.1. List of Required Functions

1. Overlaps
2. Leading Pedestrian Interval (LPI)
3. Pedestrian Sync Phases
4. Lead/Lag Phases
5. Ped 6 Actuated Only in Phase 6 & Phase 2
6. Ped Call Phase 1 and 5
7. Call Lifting/ Omit Phase
8. Detector Logic to Call Lift
9. Exclusive Phase
10. Local Preemption
11. Remote Preemption
12. Exclusive / Concurrent Pedestrian Operation (Dual Mode) by Time of Day
13. Dual Mode Pedestrian Operation by TOD / During Preempt Only Exclusive Pedestrian
14. Prepare to Stop - Dynamic Signs
15. No Right Turn - Dynamic Signs
16. Advanced Warning Beacon
17. POPP (1 or 2 Approach(s))
18. Diamond Interchange

19. Diverging Diamond Interchange (DDI)
20. Split Ring Operation
21. HAWK Signal / Flashing Pedestrian Signal
22. Vehicle Pretimed – Split phase, Actuated P4 Served in Phase 3 or Phase 4
23. NBLT (5-sec) Independent Operation from NBT
24. Flashing Yellow Arrow (FYA)
25. Reservice Phases
26. Roundabout - 4 Signalized Pedestrian Crossing
27. South Dade Transitway
28. Hard Rock Stadium - Reversible Lane Control System

4.2. Detailed Function Descriptions

4.2.1. Overlaps

4.2.1.1. Shall be able to startup in either Red, Yellow, or Green.

4.2.1.2. Must be able to have multiple parent phases.

4.2.1.3. Shall be able to have multiple conflicting phases.

4.2.1.4. Shall have yellow and red intervals, when the intervals have no setting then use the parent phase clearance values.

4.2.1.5. Shall have a programmable Minimum Green value.

4.2.1.6. Shall terminate when a conflicting pedestrian is active, provided a Minimum Green has timed out before termination.

4.2.1.7. During preempt, the overlap can be permitted or not allowed, provided a Minimum Green has timed out before termination.

4.2.1.8. Must be able to operate as a Lag overlap and have Green, Yellow, and Red timing intervals.

4.2.1.9. Must provide Pedestrian overlaps, the Walk remains ON to the next phase.

4.2.1.10. Additional overlap sets are provided when overlaps are not controlled, such as during preempt.

4.2.2. Leading Pedestrian Interval (LPI)

4.2.2.1. Must be able to provide a delay green interval by phase. At the start of the phase with a pedestrian call, the Walk interval starts while the vehicular movement remains on Red until the end of the LPI (delay green interval).

4.2.3. Pedestrian Sync Phases

4.2.3.1. The signal operation of the Pedestrians phases are assigned as the primary phases (Phase 2 and 6) and the vehicular movements is the secondary phases (Phase 4 and 8)

4.2.4. Lead / Lag Phases

There are 3 Types of Lead-Lag Operation.

4.2.4.1. Lead or Lag by TOD e.g., Phases 1 & 5 are both lead then Phase 1 Lead / Phase 5 Lag or Phase 5 Lead / Phase 1 Lag

4.2.4.2. The same vehicle moment is a Lead and then as a Lag in the same cycle e.g., the Lead movement is Phase 1, and the Lag movement is Phase 3.

4.2.4.3. Due to turning radius constraints. The two opposing movements cannot serve concurrently where vehicles path overlap e.g., Phase 1 is the Lead and Phase 5 is Lag.

4.2.5. Ped 6 Actuated Only when in Phase 6 & Phase 2

4.2.5.1. The movement has Phase 6 with an actuated pedestrian movement, Phase 1 left turn and a right-turn lane signal. A Phase 6 pedestrian call and Phase 1 vehicle call, the right turn head remains on Red. The right turn lane has a high turning volume; it is to allow the right turn movement and defer Phase 6 pedestrian call until the start of Phase 2 with Phase 6.

4.2.6. Ped Call to Phase 1 and 5

4.2.6.1. Phases 1 and 5 are protected/permissive left turns and have pedestrian movements. Typically, the protected/permissive phases are not allowed to backstep. A pedestrian call to these phases the signal must be able to backstep to serve the pedestrian call.

4.2.7. Call Lifting/Omit Phase

4.2.7.1. When signal sequence has a right or a left turn phase and these phases are also in a pedestrian phase or another vehicle movement. These overlap movements have an undesired effect of being served multiple times; the next phase is omitted, or the vehicle call is lifted to that phase.

4.2.8. Detector Logic to Call Lift/ Omit Phase

4.2.8.1. Like call lifting/lift phases uses detector logic to omit or call lift the phases.

4.2.9. Exclusive Phase

4.2.9.1. Setting an Exclusive phase, the phase is pulled out of the normal sequence and will time independently. The Exclusive phase will either lead or lag its concurrent phase depending on the placement in the sequence or on the lag setting. If other movements are allowed with the Exclusive phase, these movements must be programmed as an overlap.

4.2.10. Local Preemption

4.2.10.1. Must support at least 10 preempts and 4 Transit Priority.

4.2.10.2. Must provide Clearance and Dwell sequence and an option of a recovery sequence.

4.2.10.3. Must be able to immediately go to the Dwell sequence (no clearance sequence).

4.2.10.4. Must be able designate an overlap to be operational or disabled.

4.2.10.5. Must be able to permit or not permit pedestrian movements.

4.2.10.6. Must be able to reduce the pedestrian clearance interval when entering preempt.

4.2.10.7. When on scheduled flash; at the start of a preempt call, must be able to exit or remain on flash.

4.2.10.8. Must be able to operate dynamic signs (typically NO Left or Right turn signs).

4.2.10.9. When exiting preempt to have the option: to go Free mode before transitioning to coordination or immediately go to coordination.

4.2.10.10. Have the capability to link preempts.

4.2.10.11. During normal operation Warning flashers/beacons that alert drivers of a Signal Ahead, these flashers must remain operational during preempt.

4.2.11. Remote Preemption

4.2.11.1. A remote emergency vehicle (EV) preemption system, the controller is assigned to a route. A route can consist of one or multiple controllers. The system allows the route to be extended, terminated, or cancelled. The system terminates the route after the set time if it does not receive commands. The controller is configured to use EV preempts but the preempt call is issued remotely. The controller is programmed with dwell and exit phases with no clearance timing.

4.2.12. Exclusive / Concurrent Pedestrian Operation (Dual Mode) by Time of Day

This operation is primarily implemented on traffic signals near school zones

4.2.12.1. During school entrance and departure times, the Exclusive Pedestrian mode is set.

4.2.12.2. The Concurrent Pedestrian mode is operating at other times.

4.2.12.3. This pedestrian mode is also used at other signals with high pedestrian activity.

4.2.12.4. During transition between the pedestrian mode, the controller must complete the current pedestrian mode and not start the new pedestrian mode in the same cycle. Must not have both pedestrian modes in the same cycle.

4.2.13. Dual Mode Pedestrian Operation by TOD / During Preempt Only Exclusive Pedestrian

The intersection shall operate with two pedestrian modes:

4.2.13.1. Servicing pedestrian movement(s) concurrently with vehicular movements, or servicing pedestrian movements exclusively, based on the time-of-day schedule.

4.2.13.2. During preemption, pedestrian movement(s) must be serviced exclusively. Upon termination of preemption, pedestrian movement(s) shall resume according to the time-of-day schedule, whether concurrent or exclusive.

4.2.14. Prepare To Stop Dynamic Signs

4.2.14.1. The Dynamic signs are turned On or Off by detectors located Upstream, at the Stop bar, and Downstream and operate independently for each north-south approach.

4.2.14.2. The “Prepare to Stop” sign turns on if the Stop bar detection presence

exceeds 4 seconds.

4.2.14.3. The sign remains on if the Upstream and Stop bar detection presence exceeds 4 seconds.

4.2.14.4. The sign remains on if Downstream and Stop bar detection presence exceeds 4 seconds.

4.2.14.5. The sign goes dark when all three-detection presence exceeds 4 seconds.

4.2.15. No Right Turn Dynamic Signs

4.2.15.1. These signs are typically turned on during the adjacent pedestrian movement.

4.2.15.2. The dynamic sign displays the message “NO TURN ON RED” (R10-11) during the preceding yellow, red intervals and during the LPI interval.

4.2.15.3. There are 3 other conditions of dynamic sign operation:

4.2.15.3.1. During the LPI (delay green) or during the Walk interval.

4.2.15.3.2. During the entire pedestrian intervals (Walk and FDW).

4.2.15.3.3. A dual sign “No Turn on Red” and “Stop for Ped.” The “No Turn on Red” sign is during the LPI, and the “Stop for Ped sign” starts immediately and remains on during the remainder of the pedestrian interval (Walk and FDW).

4.2.16. Advance Warning Beacon / Warning Beacon

4.2.16.1. The Advance Warning Beacon (AWB) has a yellow beacon with an attached “Be Prepared to Stop” sign.

4.2.16.2. The beacon starts to flash several seconds before the beginning of yellow and continues to flash until the start of green.

4.2.16.3. The Time Before Yellow (TBY) in seconds must be programmable and assigned to a phase.

4.2.16.4. The TBY setting can only be used for the coordinated phases or on phases that are on maximum recall. On actuated phases the green may terminate early and is unable to do TBY.

4.2.16.5. The AWB must operate during Free mode, coordination mode, when transitioning to scheduled flash. During police hand control, the operation must start flashing at start of yellow interval (no TBY).

4.2.16.6. There are 2 AWB operation types based on the connection to the cabinet, as described below, and both must be made available:

4.2.16.6.1. AWB without flasher cabinet. The controller sends a flashing pulse to the AWB cabinet.

4.2.16.6.2. AWB with flasher cabinet. The controller sends a solid output to the AWB cabinet. The relay in the cabinet flashes the beacon.

Warning Beacon

4.2.16.7. The warning beacon has the sign but does not have a TBY, the beacon starts to flash at the beginning of yellow and continues to flash until the start of green. The same two connection configurations as the AWB (cabinet flasher or no flasher cabinet). The beacon can be used with actuated phases.

4.2.17. POPP – 1 or 2 Approach

4.2.17.1. The POPP (Protected-Only/ Protected-Permissive) is an MDC operation and was designed to have similar operation to a Flashing Yellow Arrow (FYA). A protected only operation and/or a protected-permissive operation by TOD. FYA was not adopted as a standard at that time.

4.2.17.2. For a full-quad traffic signal, it uses the overlap load switches LS 9 through LS 12 to drive the solid Green, Yellow, and Red arrows. Requires 2 of these (LS 9 -12) per 5-section signal head cluster.

4.2.17.3. The configuration requires a 660 cabinet and only 2 POPP is allowed. If the opposing approach has Protected-Permissive, it should be changed to a POPP.

4.2.17.4. The difference between a Protected -Permissive signal head from a POPP is the Red Ball is changed to Red Arrow.

4.2.18. Diamond Interchange

4.2.18.1. Must be capable of controlling a four-phase diamond interchange. To use Phases 12 and 16 to give major street traffic advance green signal while ramp service ends.

4.2.19. Diverging Diamond Interchange (DDI)

4.2.19.1. A DDI is where vehicular traffic crosses to the other side of the roadway between the ramps. DDI must handle preemptions.

4.2.20. Split Ring Operation

4.2.20.1. Create two independent ring operations.

4.2.20.2. Each of the phases are not compatible within the ring.

4.2.20.3. Use of Overlaps must only use phases within the same ring.

4.2.20.4. Coordination between the two independent rings can be accomplished by using a Ring Offset.

4.2.20.5. The offset setting controls the yield point to Ring 1 (A).

4.2.21. HAWK Signal / Flashing Pedestrian Signal

4.2.21.1. The HAWK signal is also known as Pedestrian Hybrid Beacon (PBH).

4.2.21.2. The signal consists of two horizontally red lenses arranged above a single yellow lens.

4.2.21.3. The signal faces remain dark and pedestrian display “Don't Walk” (Steady Hand) indication.

4.2.21.4. When pedestrian places a call into the controller:

4.2.21.4.1. The signal begins a brief flashing yellow

4.2.21.4.2. Then a solid yellow (yellow clearance interval)

4.2.21.4.3. Then a solid red (red clearance interval)

4.2.21.4.4. Stays in solid red, at the start of the “Walk” to the end of the “Walk”

4.2.21.4.5. A flashing red at the start of the Flashing Don’t Walk (FDW) interval

4.2.21.4.6. The signal heads flash an alternating red

4.2.21.4.7. At the end of the FDW, then a solid red (red clearance interval)

4.2.21.4.8. The signal faces go dark and remain dark until the next pedestrian actuation.

<u>Flashing Pedestrian Signal</u>

4.2.21.4.9. The flashing pedestrian signal has a standard 3-section head.

4.2.21.4.10. The signal faces are green before the pedestrian calls.

4.2.21.4.11. When Pedestrian places a call, the signal faces go to a solid yellow, and then a solid red. Then it operates similarly as the HAWK (As shown above in Steps 4-6}. The signal goes green and remains green until the next pedestrian actuation.

4.2.22. Vehicle Pretimed – Split Phase, Actuated P4 served in Phase 3 or Phase 4

4.2.22.1. The coordinated phases and their pedestrian are both set to recall.

4.2.22.2. The side streets are split phases each have actuated pedestrian.

4.2.22.3. Side street phases: Phase 3 and Ped 8, Phase 4 and Ped 4.

4.2.22.4. When in coordinated phases a call to Ped 4, Ped 4 is served in Phase 3.

4.2.22.5. When in Phase 4 and call to Ped 4, Ped 4 is served in Phase 3.

4.2.22.6. When in Phase 3 and call to Ped 4, Ped 4 is served in Phase 4.

4.2.23. NBLT (5-section head) Independent Operation from NBT

4.2.23.1. The 5-section head cluster is strictly for the NBLT.

4.2.23.2. The solid red section head is replaced with a red arrow section head, same head configuration as the POPP but the signal operation is different.

4.2.23.3. The operation is to have protected/permissive left turn to operate independent from the NBT.

4.2.23.4. When the NBLT green arrow or yellow arrow are on, the solid green or solid yellow remains dark. After the yellow arrow, the red arrow displays then the solid green.

4.2.23.5. During some of the phase sequences:

4.2.23.5.1. NBLT has green arrow only and NBT is solid red

4.2.23.5.2. The NBLT is red arrow and NBT is green

4.2.23.5.3. The NBLT goes solid yellow then red arrow and NBT remains in green

4.2.24. Flashing Yellow Arrow (FYA)

4.2.24.1. FYA has several signal operations such as protected only, permissive only, protected / permissive. FYA must be able to change to the above-

mentioned operations by TOD.

4.2.24.2. Inhibit the FYA during a conflicting pedestrian movement, inhibit FYA during the LPI.

4.2.24.3. FYA operations must work with dynamic signs that are controlled by the LPI.

4.2.24.4. FYA operation must be able to operate in preemption.

4.2.24.5. MDC require a standard FYA configuration to use channels 9 through 12 only.

4.2.25. Reservice Phases

4.2.25.1. This function allows to terminate the sync phases after timing the minimum green time and permit the phases that assigned to reservice. A reservice time is programmed and the reservice phases may be served multiple times within the reservice time. Consideration must be given to minimum green and clearance times of the sync phases and reservice phases to program the reservice time.

4.2.26. Roundabout – 4 Signalized Pedestrian Crossing

4.2.26.1. Roundabout with 4 signalized pedestrian crossings, uses 4 rings, each pedestrian crossing is assigned to a ring. Each crossing may operate independently or may operate concurrently.

4.2.26.2. Logic to stop inbound traffic when departing leg is occupied.

4.2.27. South Dade Transitway

4.2.27.1. The Transitway is a two-way, 20-mile road, which runs parallel to US1 or to Old Dixie Hwy, from US 1 & Datran Dr to US 1 & SW 344 St. A list of the signals is at end of this function.

4.2.27.2. The Transitway runs concurrently with the adjacent signals on US 1 – Old Dixie Hwy coordinated phases.

4.2.27.3. The Transitway is close to the US 1 and Old Dixie signals a single cabinet runs the Transitway intersection and US1 or Old Dixie intersection.

4.2.27.4. The design is to use Phase 2 Walk permissive window to determine when the Transitway demand can be served. Phase 6 Walk permissive window is used when Transitway runs on the east side.

4.2.27.5. The Walk permissive window permits the Transitway to service multiple times in the cycle.

4.2.27.6. The Transitway typically has 3 vehicle detectors, at the Stop bar and at 2 advance detections which have programmed call delay during the red interval in the Transitway.

4.2.27.7. The Transitway may have pedestrian movement, it is served concurrently with the vehicle movement.

4.2.27.8. There are several emergency vehicle traffic signals that preempt the Transitway signals.

4.2.27.9. Overlaps must time a minimum green before they are terminated, such as right-turn associated with permissive window.

4.2.27.10. Transit buses are classified as local or express. The express buses when entering a geo-fence transmit a message to Transit Central System which then remotely sends request to TSS Central System to request for a transit signal priority (TSP). The normal signal operation is interrupted, and TSP is implemented. After completing TSP, the normal signal operation is resumed. Local buses use the detection system.

4.2.27.11. In the AM-Peak, TSP is provided to the express bus traveling northbound.

4.2.27.12. In the PM-Peak, TSP is provided to the express bus traveling southbound.

4.2.27.13. An express bus traveling in the opposite direction, TSP is not called and uses the local detection to proceed.

<u>There is a total of 46 crossing:</u>

- Datran Dr
- SW 98 St
- SW 104 St
- Killian Dr (112 St)
- SW 124 St
- SW 128 St
- SW 132 St
- Howard Dr (136 St)
- Mitchell Dr (144 St)
- Coral Reef Dr (152 St)

- Colonial Dr (160 St)
- Richmond Dr (168 St)
- Banyan St (173 St)
- Hibiscus St (176 St)
- SW 184 St
- Quail Roost Dr (SW 186 St)
- Marlin Rd (107 Av)
- Caribbean Blvd (200 St)
- SW. 112 Av (Allapattah Rd)
- SW 117 Av
- SW 216 St (Hanlin Mill Rd)
- SW 220 St
- Miami Av (SW 224 St)
- SW 232 St
- SW 132 Av
- SW 244 St
- SW 248 St
- SW 137 Av (Tallahassee Rd)
- SW 252 St
- SW 260 St
- SW 264 St (Bauer Dr)
- SW 146 Ct
- SW 272 St (Epmore Dr)
- SW 280 St (Waldin Dr)
- SW 157 Av (Newton Rd)
- SW 288 St (Biscayne Dr)

- SW 296 St (Avocado Dr)
- SW 304 St (NE 15 St) (Kings Hwy)
- SW 308 St (NE 11 St)
- SW 312 St (Campbell Dr) (NE 8 St)
- NE 2 Dr / Civic Ct
- S Mowry Dr (SW 320 St)
- Krome Av (177 Av)
- SW 324 St (SW 4 St)
- SW 328 St (Lucy St)
- SW 336 St (Davis Pkwy)

Overview of the South Dade Transitway – Operations

- A project currently under construction on the Transitway changes its operation and is described below.
- Two traffic signal controllers to be installed, a Transitway controller and the US1-Old Dixie Hwy (adjacent) controller. A gate controller to manage the gate arms and signals.
- A camera system to identify between local, express buses, maintenance vehicles and other vehicles such as emergency vehicles (EV). The system identifies when vehicles are in the “block the box” zone.
- The express and local buses when reaching a geo-fence transmits to the Transitway controller to commence to change the signal to serve the buses. The maintenance vehicle and the EV are detected at the Stop bar detector from the camera system.
- Gate crossing arms and gate signals are introduced to east-west approach but only one arm in each direction and operate all the times of the day.
- The gate arm is lowered during the express and local buses.
- The gate arm remains up during maintenance vehicles and emergency vehicles or when “block in the box” is sensed.
- A damaged gate arm, a failure notification is sent to both Transit Central and TSS Central and the Transitway signal is set to flash Red to all approaches.
- The Transitway signal communicates peer-to peer with the adjacent signal of

pending signal change and the gate controller. The buses send a preempt command to the adjacent signal. The other vehicle types are served during adjacent Walk permissive window.

- Overlaps must have timed a minimum green before they are terminated.

- The Transitway signal must manage the preempt from emergency vehicle signals. Transitway pedestrian crossings are being modified. On the station platform the pedestrian indications change to Don't Walk when the preemption or gate operations commence.

- Transitway signals operations may impact nearby traffic signals. These impacted signals operations are modified to operate in with the Transitway signal.

- There are Transitway signals that have no adjacent or nearby traffic signals, these have the same equipment and similar operation.

4.2.28. Hard Rock Stadium – Reversible Lane Control System Operations

The new controller functions must replicate the below operations:

4.2.28.1. The reversible lane control system (RLCS) is on NW 199 St and is used to manage lane usage from NW 27 AV to NW 2 AV during events at the Hard Rock Stadium. There are 22 lane control gantries, they are labeled A to V.

4.2.28.2. The west-most gantry is labeled A and the east-most gantry is labeled V. The RLCS normally is in "No Display" until a request is made. The RLCS uses high speed Ethernet connection for command and status data between the local master and central. The local master communicates to each of the gantries. The slave gantry sends status back to the master.

4.2.28.3. Six surveillance PTZ cameras are installed along the corridor to monitor event traffic and can be remotely controlled. Each gantry has a D170 controller/cabinet with Reversible Lane Control firmware installed and CMU is programmed specifically to that gantry operation.

4.2.28.4. The RLCS is integrated into the KITS-ATMS menu. Select– RLCS – Timing Plan – Select Master – NW 199 St, Select the desired Plan Number. The Plan Numbers are described below.

- Non-Display (Dark)
- Light Inbound
- Medium Inbound
- Average
- Light Outbound

- Medium Outbound
- Heavy Outbound
- Schedule TOD

This plan selection is available at the local master controller cabinet.

4.2.28.5. At the start of an event, Average is selected, it turns on a Left Only then proceed to Light Inbound then a Red X appears or a Green Arrow depending on the configuration and having a buffer travel lane. As it proceeds through the other plans these heads will change. During the event, the RLCS is placed in Average. Before the end of the event, is changed from Average to Light Outbound. It cycles back to Average then non-display.

4.2.28.6. The program expects transitions between each mode to be completed within 20 seconds. If the transition exceeds 30 seconds an alarm will be displayed. The program shows the current display status and the requested mode and has the capability to scheduling events.

4.2.28.7. Traffic signals operations such as left turns phases are omitted during the event so as not to conflict with gantry indications.

4.2.28.8. If two consecutive gantries are dark, the local master controller issues a shutdown of the system and alerts the RLCS central of the outage.

The review, testing, and monitoring process for each function must confirm that all functions operate as intended, without affecting any other existing functionalities of the controller database.