SECTION 77 – FIBER OPTIC CABLE AND AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM (ALCMS)

77- 1 DESCRIPTION

The Contractor shall perform all work required by the plans for construction of new fiber optic cables and modifications to the Airport Lighting Control and Monitoring System (ALCMS) and appurtenant equipment and structures in accordance with this specification and other referenced specifications, as included and modified hereafter, and as shown on the Plans.

Because of the specialized nature of this work, the Contractor or subcontractor performing the work shall meet the pre-qualification requirements set forth herein.

77-1.1 BACKGROUND

The existing ALCMS is manufactured and supplied by Crouse-Hinds Airfield Lighting Products. The modification to the existing system shall be carried out by the Contractor, with the participation of Crouse-Hinds Airfield Lighting Product Company, or by an equally capable manufacturer, having experience in the existing ALCMS.

77-1.2 QUALIFICATIONS

The replacement of the fiber optic cables and appurtenant systems involve systems and modifications to ALCMS are extremely critical for the safe operation of the Airport. Because of the critical, and highly specialized, nature of the work and equipment, modifications to the ALCMS will require the Contractor or specialty subcontractor to be highly experienced and qualified. The Contractor shall ensure that:

(1) That the Contractor or Sub-contractor is a specialized installation contractor in this field.
(2) That the Contractor or Sub-contractor currently has, or within the last year, has contracted with the FAA or other airport agencies to perform similar work.
(3) That the Contractor or sub-contractor has at least 5 years experience with similar fiber optic installations, including coordinating and testing.

77-1.3 SUBMITTAL OF QUALIFICATIONS

On or within two (2) weeks after the date of the Notice to Proceed, the Contractor shall submit a complete qualification package to LAWA presenting the qualifications and experience of the firm proposed to perform the modifications to the fiber optics system and existing ALCMS. The manufacturer shall demonstrate knowledge of the existing system, listed in FAA Approved Equipment List AC-150/5345-53, and shall be an FAA Approved Supplier of L890 Airport Lighting Control and Monitoring Systems. Included shall be detailed resumes of the proposed on-site Supervisor and Project Manager for the fiber optics and ALCMS work. LAWA may reject the proposed firm and request substitution prior to awarding the contract if the requirements of this specification are deemed not to have been met.

The ALCMS modifications supplier must demonstrate the ability to use the existing system hardware and software and integrate the modification to the existing system under this contract.

77-1.4 PROJECT SCOPE

Fiber optic system modifications shall consist of furnishing and installing all underground fiber optic cable, inner duct, in accordance with these specifications at the locations shown in the plans. Modifications shall include splicing, critical operational fiber optic transfers, cable marking and testing of installation and all incidentals necessary to place the cable in operating condition as a complete unit to the satisfaction of the Engineer. The work shall include providing cables, cutting old cable to create slack for splicing, splicing cables, labeling, re-termination, coordinating cutovers with the involved agencies, and testing.

Conduit, duct bank, pullboxes and associated construction methods are covered in Sections 71 and 72 of these Specifications, and power and grounding cables are covered in Section 69 of these Specifications.

When new cable runs are installed, and cutover from existing systems are ready to be made, a period of shutdown will be coordinated with LAWA for cutover. These shutdown periods will likely be late night/early morning and/or weekends, and will be limited to a 4 hour duration.

a. Fiber Cut LAWA ALCMS

A. Agencies involved

(1) FAA
(2) LAWA IT
(3) Airfield Ops
(4) LAWA Electric Shop

B. Affected Circuits

(1) Airfield Lighting Circuits

C. Required Work/Restrictions

(1) Perform all new work prior to cutting existing conduit run. Coordinate cutting/splicing with owner/operator agency.
(4) Contractor shall fusion-splice the existing pulled-back cables to the newly installed bypass cable.
(5) After splices are complete, Contractor shall contact LAWA Inspection to have Airfield Operations and LAWA Electrical Shop verify that all circuits are operational.

D. Test Points

(1) ATCT.
(2) Airfield Electrical Vault.

E. Cable

(1) Corning Cable Systems ALTOS® LST™ 12 fiber cable:

b. ALCMS Scope of Work

A. Existing Airfield Lighting Vaults contain Constant Current Regulators (CCRs) which provide power and control for the airfield lighting system. There are Crouse-Hinds "Digitrac" and "Megatrac" control cabinets for each of the CCRs.

B. Due to runway and taxiway airfield work, the graphic displays at Airfield Lighting Vaults No. 1, No. 2N, No. 2S, No. 3, Maintenance Facility and Control Tower shall be modified to include the changes. The Contractor will incorporate all necessary software and hardware changes required to accommodate the new construction into the existing system.

C. All Digitrac/Megatrac control cabinets located in Airfield Lighting Vaults No. 1, 2N, 2S, and 3 that are affected by the modifications under this contract shall be re-calibrated to accommodate the changes.

D. The scope of work also includes software, programming, calibration, on-site commissioning, on-site testing, on-site training, all system manuals, and any other materials, tools and equipment to provide a fully functional and complete system to the satisfaction of owner.

c. Fiber Optic Installation Equipment Specifications

(1) Stripping Tools

a. Chemical and mechanical stripping methods and materials shall be of a design that will not damage the optical fiber or termination elements.
b. Fixed fiber diameter tools shall be capable of removing the coating from one specific fiber diameter (e.g., 125 microns).
c. Variable fiber diameter tools shall be capable of removing the coating from a range of fiber diameters. This shall be accomplished by using interchangeable die to accommodate the different fiber diameters.

(2) Cleaving Tools

a. Fiber cleaving tools shall be of a design that will allow a clean; fragment-free, crack-free cleave which minimizes chips or other defects on the cleaved fiber end.
b. A precision fiber cleaver shall be used for cleaving the fiber to the proper length with a typical cleave angle within 0.7° of perpendicular.
c. The cleaving tool shall be capable of allowing the operator to control the strip length of the fiber in order to meet engineering documentation requirements.
d. Acceptable Products: Alcoa AFL CT-20 Fiber Cleaver or equal.

(3) Splicing Tools

a. The Contractor shall use a fusion splicer that has the following specifications:

1) Core-to-core fiber profile alignment system (PAS).
2) Full automatic operation.
3) 2 CCD cameras, no up-down mirror.
4) High resolution LCD monitor.
5) Simultaneous X & Y axes observation.
6) Automatic arc calibration function for stable arc discharge.
7) Automatic fiber type identifier and self diagnostic test function.
8) Typical 0.02dB with SM fiber, typical 0.01dB with MM fiber.

b. Acceptable Products: Alcoa Fujikura FSM-40S Splicer or equal.

(4) Inner Duct

a. All inner ducts for fiber optic cable are to be of the corrugated type. Inner ducts that share a common 4"C conduit shall have different color tracing identifiers, (blue, orange, and green).
b. Inner duct shall have measured mule tape inside. All inner-duct shall be corrugated, 1" in size, as indicated shown on the plans.

d. ALCMS Fiber

Fiber for ALCMS Fiber shall be: Corning Cable Systems ALTOS® LST™ 12 fiber cable with twelve 62.5 multimode fibers in two six fiber loose tube jell filled buffer tubes with PE outer jacket, dielectric central member, ripcord, Water-Swellable Tape and Colored Optical Fibers.

e. Fiber Optic Splice Case

A. Preform Line Products Coyote Runt closure

1) Preform Line Products Coyote 12 fiber splice trays.
2) Preform Line Products Runt Manhole Support Kits.

77-1.5 INSTALLATION METHOD OF CABLES

A. All rack steps will have rack clips installed to keep rack steps attached to racks.
B. With regards to fiber optic cable, at every 1300' interval between underground pullboxes, 50' of slack shall be secured to two rack steps anchored on one side of pull box.
C. FAA fiber optic inner duct and cable may travel in the same duct bank with the 2400volt FAA power cable with no separation, although the two cables shall be in their own respective conduits.

77-1.6 INSTALLATION OF DUCT OR CONDUIT

A. Inner duct coupling is to occur only by matching color trace on inner duct at either end of pull box, manhole, etc. Couplers are to be used in manholes, pull boxes, or vaults only. No couplers are to be used and pulled into duct bank.
B. A magnetic caution tape is to be placed over all duct banks in their entirety from box to box.

77-1.7 CABLE CUT OVERS

A. All cable cuts must be coordinated between the Contractor and all involved agencies. Proposed cut plan must be submitted to all agencies and times and methods must be approved before proceeding.

77-1.8 FIBER OPTIC CABLE TERMINATING

A. The Contractor shall only fusion-splice pigtails that have had the connectors installed and polished by the manufacturer or local cable assembly house. The Contractor shall not install or polish fiber optic connectors, either in the field or in his shop.
B. ST pre-connectorized, pre-terminated, pigtails shall be fusion spliced to the cable.
C. Fiber optic cable used in the assembly of the pigtails shall have similar optical characteristics as the installed fiber optic backbone cable.

D. Mechanical splices are not permitted.
E. The Contractor shall protect all fusion splices with rod-reinforced heat-shrink protective sleeves and installed in a specified splice tray.

77-1.9 TESTING

A. All working Fibers shall be verified with assigned agency to check that working circuit is working after cut. If circuit is not operational, fibers must be tested to find reason for failure and corrected.
B. All vacant fibers shall be OTDR tested and results provided to the Communication Center. The accepted splice loss for single mode and multimode fibers shall be equal than or less than .15 dB. Multimode shall be tested at 850nm, and Single mode shall be tested at 1310 nm. If the splice point is greater than .15 db it must be re-spliced. If it still fails Fiber can be bi-directionally tested and if the average of the splice loss value is below .15db the splice will be accepted.

77-1.10 OTHER REFERENCED SPECS

Installation of conduit, duct, duct bank, power and communication cables shall be as specified in Sections 71 and 72 of these Specifications.

77-1.11 PROJECT COORDINATION

A. ALCMS upgrade manufacturer shall provide an experienced and qualified technician to support the Contractor and LAWA airport throughout the installation and warranty period of the system.
B. The ALCMS modification work requires close coordination and scheduling with the Engineer, LAWA, and FAA. When the work requires access to the Airfield Lighting Vaults, Maintenance Facility, Control Tower and other areas, the Contractor shall give 2 weeks prior notice to the Engineer for scheduling the work.
C. Contractor shall furnish a work schedule describing the basic cycle of events and sequence of work, to the Engineer for review, prior to the start of the project.

77-1.12 INSTALLATION AND COMMISSIONING

A. The installing contractor shall be responsible for the physical installation of all associated ALCMS upgrade components.

B. Manufacturer shall perform as a minimum, the following installation and commissioning tasks:

(1) Verify Contractor connections including power, control and monitoring.
(2) Perform all hardware calibrations.
(3) Perform system testing including control, monitoring and diagnostic.
(4) Perform System Acceptance Testing (SAT).

77-1.13 SYSTEM ACCEPTANCE TEST (SAT)

A. Detailed field test plan shall be submitted to the Engineer for review.

B. Following the final installation, commissioning and calibration of the system, manufacturer shall perform on-site a demonstration of the system performance. This demonstration shall include but not limited to, the following:

(1) Control functions
(2) Monitoring functions
(3) Surveillance functions
(4) Alarm functions
(5) Print functions
(6) Display functions

The SAT must be witnessed by the Engineer and LAWA. The SAT must demonstrate operation of the software and hardware to the satisfaction of the Engineer and LAWA. A report of the SAT must be provided by the manufacturer when the testing is complete and results accepted by the Engineer.

C. As part of the SAT, the system must also complete one (1) week of continuous operation.

77-1.14 AS-BUILT DRAWINGS

A. Contractor shall provide updated as-built drawings incorporating the modifications to the ALCMS.

77-1.15 OPERATION AND MAINTENANCE MANUALS

A. Manufacturer shall provide six (6) typewritten, easy to understand hard cover instruction manuals suitable for daily operation and maintenance of the system. The instruction manuals shall include as a minimum the following information:

(1) Operational overview and system description
(2) Logic and block diagrams
(3) Graphical User Interface Screen operation
(4) User configuration tools instruction manual
(5) System Block Diagram
(6) Drawings and data sheets of major system components
(7) Detailed external wiring diagrams (Electrical Contractor wiring)
(8) Detailed assembly drawings and wiring diagrams
(9) Original Equipment Manufacturer (OEM) Manuals

B. Manufacturer shall provide six (6) operation manuals for the Air Traffic Controllers (ATC) that are hard-covered and suitable for daily operation of the system. As a minimum, the manuals shall include the following information:

(1) Touch screen operation (human machine interface)
(2) Touch screen maintenance (i.e. calibration)

77-1.16 SYSTEM WARRANTY

A. All new equipment shall be warranted against defects in workmanship, hardware and software for a period of twelve (12) month after substantial completion of the project.

77-1.17 SPARE PARTS

A. A recommended spare parts list shall be included with the Submittal including part numbers and pricing. These prices shall be valid for (12) months from date of substantial completion.

77- 2 EQUIPMENT AND MATERIALS

77-2.1 GENERAL

New equipment and new material included in the allowance for the modifications to the existing ALCMS shall match the existing equipment and material.

77- 3 METHOD OF MEASUREMENT

77-3.1 The modification work of the existing ALCMS shall be measured as a lump sum item, which will include all hardware, software, calibration, testing, commissioning, training, operations and maintenance manuals and all other incidental items for a complete operational system. The payment shall be made out of an allowance stipulated in the "Schedule of Work and Prices" as a part of the Bid Package. Payment shall be made based on Contractor's invoice including actual labor and material expended. Any and all unused portions of the allowance shall not be paid to the Contractor.

77-3.2 Fiber optic cable, of the types and sizes indicated, as required to complete the work shown on the plans and described in this section will be measured for payment at the contract price per linear foot, measured in place.

77-3.3 Fiber optic inner duct, of the types and sizes indicated, as required to complete the work shown on the plans and described in this section will be measured for payment at the contract price per linear foot, measured in place.

77-3.4 Measurement and payment for pullboxes and manholes as required to complete the work shown on the plans and described in this section will be made under Section 56 of these Specifications, Section 56-Airport Electrical Underground Duct, Pullboxes and Manholes (FAA-L-110).

77-3.5 Measurement for cutting and splicing of all cables as required to complete the work shown on the plans and described in this section will be as one complete lump sum item, including as required by the plans to complete the work.

77-3.6 Trenching, backfilling, cable connection, testing, agency coordination and other miscellaneous work as required by the plans complete the work shall not be measured for payment but will be considered incidental to other pay items and no separate payment will be made.

77- 4 BASIS OF PAYMENT

77-4.1 Payment for the modifications to the existing ALCMS shall be paid from the allowance stated in the "Schedule of Work and Prices". This price shall be full compensation for furnishing all materials, labor, equipment, supervision, tools and incidental necessary to complete the ALCMS modification work. The Contractor will be compensated under this allowance item as stipulated in Section 9-4 of these specifications.

77-4.2 Payment for 12SM/12MM Fiber Optic Cable will be made at the contract unit price per linear foot. This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item.

77-4.3 Payment for Inner Duct will be made at the contract unit price per linear foot for inner duct of the sizes and types indicated. This price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item.

77-4.4 Payment for cutting and splicing of all cables required to complete the work under this section will be paid at the contract lump sum price. This price shall be full compensation for furnishing all labor, equipment, tools and incidentals necessary to complete the item.

77-4.5 Trenching, backfilling, cable connection, testing, agency coordination, relocating existing ALCMS equipment and other miscellaneous work as required by the plans to complete the work shall not be measured for payment but will be considered incidental to other pay items and no separate payment will be made.

No additional payment will be made for difficulties encountered when accomplishing work under this section in areas of restricted work periods, night construction, or in other areas subject to construction phasing or agency coordination restrictions.

Payment will be made under:

Item 77.1	Modifications to ALCMS	per allowance
Item 77.2	12SM/12MM Fiber Optic Cable	per linear foot
Item 77.3	1" Inner Duct	per linear foot
Item 77.4	Fiber Optic Cuts and Splices	per lump sum

END OF SECTION 77