SECTION 28 16 43

perimeter INTRUSION DETECTION SYSTEM

fiber optic - Field mount

1. GENERAL
   * + 1. SCOPE OF WORK
          1. It is the intent of the Owner to purchase all the necessary components for a complete, installed and operable fiber optic intrusion detection system for fence application.
          2. The perimeter intrusion detection system shall be as described herein specified and indicated on any attached drawings, which define the general scope of the required services.
          3. The system shall comply with the requirements of the National Electric Code and applicable provisions of National Fire Protection Association Standards and shall meet all requirements of the local authorities having jurisdiction.
       2. GENERAL PERFORMANCE REQUIREMENTS
          1. SYSTEM DESCRIPTION

The system shall be based on a multimode fiber optic sensor with a single-zone, DSP-based Processing Unit (PU) designed and configured for fence application.

The fiber optic intrusion detection system shall function as a perimeter intrusion detector. The basic system shall consist of a fiber optic sensor cable and a single-zone alarm processing unit.

The system shall detect intruders and generate an alarm based on changes created in the sensor cable’s optical signal by any intruder action that causes vibration, motion, or pressure.

The system shall be capable of stand-alone operation. The system shall also be capable of integrating itself into a central control system by providing alarm relay contact outputs and/or an IP interface, depending on requirements of the alarm monitoring system.

The performance criteria required for this project shall meet or exceed the standard specifications for the perimeter intrusion detection sensor system as provided by the original equipment manufacturer.

* + - 1. SUBMITTALS

The Contractor shall submit the following documents for review and approval prior to any shipment of components:

* + - * 1. Installation/operation manuals and instructions for all equipment furnished under this system.
        2. An overall perimeter site plan showing the detection zone layout.
        3. Site-specific layouts shall be provided showing major components and interconnections located on the perimeter.
        4. Standard system and sensor cable layout drawings shall be provided to the installer.
      1. SYSTEM TECHNOLOGY
         1. Alarm Processor

The Processing Unit (PU) shall analyze the signals from the fiber optic sensor cable and shall detect vibration, motion, or pressure. The PU shall use advanced algorithms to determine actual alarms versus false or nuisance alarms.

The light source shall be a LASER or equivalent optical source providing sufficient coherent light to meet the system’s performance requirements.

The PU shall support a total sensor cable length of up to 5000 meters (3.1 miles/16,400 feet).

Signal Processing Algorithms

The system shall use digital signal processing and adaptive algorithms capable of adjusting the performance to specific fence types and environmental conditions. The PU shall have two parallel internal processors - Processor 1 and Processor 2 - where a separate calibration is allowed for either processor providing detection for two distinctly different intrusion scenarios. Either processor may be turned ON or OFF. If they are both on, they are logically OR gated so that an ALARM will occur if the conditions for either Processor 1 or Processor 2 are satisfied.

* + - * 1. Fiber Optic Cable

The fiber optic sensor cable shall be made of glass. The fiber shall be compatible with LASER light sources and shall be a multimode fiber cable design. Jacketing shall be available in different diameters which shall be dependent on application. The jacketing shall be designed for use on or in: interior spaces, plenum chambers, fences, non-metallic flexible or rigid conduits, under roof material, and in concrete or stucco finishes.

* + - * 1. Laser Monitoring

Each PU shall monitor the returning laser power and generate a “Fault” alarm if power falls below a pre-determined value.

* + - 1. SYSTEM PARAMETERS
         1. Processor Adjustments

The PU processors shall have the following adjustments, menus, or entries available for tuning and setting up the system.

System:

Gain (overall system sensitivity)

Alarm relay duration

Tamper switch enable/disable

Processor 1:

Enable/disable

Level of signal

Lowest frequency

Highest frequency

Duration of signal

Low level tolerance

Event count

Event window

Event mask time

Processor 2:

Enable/disable

Level of signal

Lowest frequency

Highest frequency

Duration of signal

Low level tolerance

Event count

Event window

Event mask time

* + - * 1. Perimeter Maximum Sensor Cable Length

Each PU alone will be capable of supporting Zones using up to 5 km of sensing fiber optic cable. Multiple PUs shall be capable of protecting a perimeter of any length when used in tandem with sensor cable.

* + - 1. DETECTION PROPERTIES
         1. Detection Sensitivity

Sensitivity shall be linear across the entire zone and shall be adjustable for each zone’s specific requirement.

* + - * 1. Probability of Detection

A properly installed system shall be capable of achieving a Probability of Detection (PoD) rate which shall be 95% or better.

The PoD and error rate is not fixed, and is a function of the parameter settings of the PU and sensor cable configuration.

PoD for an installed system cannot be stated without site and zone specific configuration testing to determine the PoD.

The more areas tested and the stricter the written test procedure used, the better the confidence level and more accurate the PoD result will be.

Testing procedures shall match the security level of the installation, which shall match the facility’s security level requirements. Stealthy or mechanically assisted climbing on low security installations would be inappropriate.

The manufacturer shall suggest testing methods to verify system performance.

* + - * 1. False and Nuisance Alarms

The system shall be set up to minimize both false and nuisance alarms by use of all the adjustments available. The detection zone shall be subsequently tested and inspected to determine if any problems exist that may cause these types of alarms. See section 1.05A.

System Internally-Generated Alarms (False Alarms)

False alarms are caused by software/equipment anomalies resulting in equipment failure.

The maximum allowable False Alarm Rate (FAR) for an PU due to internally generated alarms shall be less than one per zone per year, averaged over the total number of zones in the system.

Environmental Alarm (Nuisance Alarms)

Nuisance alarms are defined as those alarms generated by a properly functioning PU and attached sensor cable, where the cause is known or suspected, and is not an intentional intrusion attempt (e.g. animals, wind-blown debris, etc.).

The system shall operate as specified when installed properly to the manufacturer’s recommendations in outdoor environments. The system shall be installed and the site and fence prepared before installation in such a manner as to minimize the Nuisance Alarm Rate (NAR).

Ground vibration from nearby trains or heavy vehicle traffic near the fence line may cause nuisance alarms. These causes shall be filtered out through calibration of the system.

Any site-specific concern, or any unusual application or condition that may lead to an unacceptable false or nuisance alarm rate, or other system problems, shall be communicated to the factory for analysis before ordering or installing any system. Such concerns are best resolved by submitting photos and detailed synopses to the factory. Solutions to potential problems can usually be found through subsequent site work recommendations and selection of equipment designed to address concerns.

* + - 1. SENSOR CABLE

The sensor cable shall have a polyurethane outer jacket that is resistant to cuts, abrasions, UV radiation, and chemicals.

* + - * 1. Sensor Cable Types

SC3-C

The sensor cable shall be 3mm (OD) with a polyurethane outer jacket inserted in a polyethylene UV inhibited conduit to protect the fiber and ensure maximum acoustic cooling.

SC4

The sensor cable shall be single-fiber in a 4mm (OD) cable designed for attaching cable directly to the fence with UV resistant nylon cable tie provided by the manufacturer.

* + - * 1. Cable Lengths

Sensor cable is available in any length up to 2000 meters/6500 feet per spool.

* + - * 1. Zone Lengths

Zone lengths shall be determined by the physical shape of the perimeter and the security level required by the facility.

1. PRODUCT
   * + 1. ALARM PROCESSING UNIT AND SENSOR CABLE SPECIFICATIONS
          1. Alarm Processing Unit (PU)

Each Processing Unit (PU) and sensor cable shall conform to the following specifications as a minimum.

Each Processing Unit (PU) shall support 1 or 2 zones up to the maximum allowable sensor length of 5000 meters (3.1 miles/16,400 feet).

The PU shall be capable of operating as a stand-alone unit, with relay output for alarm, or as an integrated member of a centralized alarm-reporting network utilizing multiple PUs.

The PU shall provide an internally maintained alarm record of the latest 128 alarm events.

The PU circuitry shall be protected from lightning or other voltage surges on all wired connections.

* + - * 1. PU Mounting

The PU must be capable of being mounted in an environmental enclosure at or near each zone. Both signal and power wiring must be brought to the enclosure.

* + - 1. SIGNAL PROCESSOR OPERATION
         1. Independent Processing

No single Processing Unit failure shall cause any other PU along the perimeter to stop functioning in a normal manner. An PU failure shall result in no more than 2 zones failing at a time.

This unlimited length is a result of the independent processing and is only limited by the associated, but separate, alarm reporting network and front-end equipment capacities.

* + - 1. ALARM OUTPUTS
         1. Alarm Relay Outputs

An alarm relay output shall be provided from a 100 mA, 24 VDC Form “C” relay, with normally-open and normally-closed contacts. If power is removed from the unit, the relay shall fail in the alarm position.

* + - * 1. IP Outputs

The PU shall provide alarm type distinction between intrusion attempts, fault conditions, and tamper conditions when integrated with central station equipment or other enunciator via the units IP port.

* + - 1. LASER OUTPUT MONITORING

The LASER level output shall be monitored at the receiver end and a fault condition shall be reported if the level drops below a preset level.

* + - 1. SYSTEM CALIBRATION
         1. All system performance variables described in Section 1.05 of this document shall be adjusted using a hand-held calibrator.
         2. Alternatively, adjustments can be made to the PU using a standard Windows-based pc with an ASCII terminal emulator utility or software provided by the manufacturer.
         3. Access to the PU calibration port shall require that the enclosure be opened, which will trigger a tamper alarm.
         4. The LASER shall not require calibration or adjustment of any kind in the field.
      2. PASSWORD PROTECTION
         1. Each PU shall provide access and control security in the form of passwords to prohibit unauthorized access to the adjustment and calibration menus of the system. Each unit shall be shipped from the factory with a default set of access passwords that may be changed by the user.
         2. There shall be no hidden password entry or other physical means to access the adjustable parameters of the system. Once a password change has been made, only the revised password(s) may provide access to the system. Should a primary password lost, the PU must be returned to the factory for replacement of firmware and re-initialization of the PU's circuitry.
      3. ELECTRICAL SPECIFICATIONS

Each PU shall conform to the following input/output specifications as a value or range.

|  |  |
| --- | --- |
| Voltage | 12 to 24 Vdc |
| Power | 3.0 Watts @ 12 Vdc, 25°C |
| Connector Strip | 28 to 14 AWG |
| Relay Contacts | 100 mA, 24 VDC Non-inductive |
| Contact Isolation | 250 VAC |
| Serial Port | RS-232C |
| Tamper Switch Contacts | 100 mA, 24 VDC |

* + - 1. ENVIRONMENTAL SPECIFICATIONS

Each PU shall conform to the following specifications as a value or range.

|  |  |
| --- | --- |
| Temperature | ‑30° C to 55° C (‑22° F to +131° F) |
| Humidity | 0 to 95% Non‑condensing |

* + - 1. PHYSICAL SPECIFICATIONS

Each PU shall conform to the following specifications as a minimum value or range.

* + - * 1. Alarm Processing Unit (PU)

Overall Dimensions

Length – 10.06 inches (25.55 cm)

Width – 5.63 inches (14.30 cm)

Depth – 0.94 inches (2.39 cm)

* + - * 1. Enclosure

The enclosure shall consist of a fiberglass polyester NEMA‑EEMAC Type 4X UL 508 TYPE 4X and CSA Enclosure Type 4 and 5 standards, with an enclosure flammable rating of UL94‑5V.T. Quick release latches with knockout padlock provisions shall be provided.

Optional Enclosure

The enclosure shall be a fiberglass polyester NEMA\_EEMAC Type 4X, and shall conform to UL 508 Type 4X, and CSA standards.

Overall Dimensions:

Length ‑ 16.5 inches /41.91 cm

Width - 14.44 inches /36.68 cm

Depth ‑ 8.26 inches /20.98 cm

* + - 1. FIBER OPTIC CABLE SPECIFICATIONS
         1. Each sensor cable shall conform to the following specifications as a value or range by type.

|  |  |
| --- | --- |
| Material | Proprietary construction  UV-resistant polyethylene  Pre-installed tight buffered multimode fiber optic strand |
| Cable Type | SC-3 (3mm) Proprietary multimode fiber-optic sensor cable |
| Combined Weight | .056kg/m (800m spool approx. 50kg with spool, 61cm x 61cm x 76.2cm) |
| Conduit Outer Diameter | 12.7mm (0.5 inches) |
| Conduit Color | Light grey. Custom colors available upon request. |
| Operating Temperature | -40°C to + 104°C (-40°F to +220°F) |

* + - 1. SYSTEM AVAILABILITY

A product meeting or exceeding this perimeter intrusion detection sensor specification is manufactured by:

Fiber SenSys

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1. EXECUTION
   * + 1. TESTING, GUARANTEE, AND SERVICE
          1. The system shall be free from defects in workmanship and materials, under normal use and service, for a period of two years from the date of shipping.
          2. The local service organization servicing the warranty period for the above equipment shall become certified in its use before installation of the equipment.
          3. Any equipment shown defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.

END OF SECTION