SECTION 28 16 43

perimeter INTRUSION DETECTION SYSTEM

fiber optic – remote 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-based fence line intrusion detection system.
          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.
       2. GENERAL PERFORMANCE REQUIREMENTS
          1. SYSTEM DESCRIPTION

The system shall be based on a multimode fiber optic sensor with single-zone/channel, DSP-based Processing Unit (PU) designed and configured for fence line, wall, or buried zone intrusion detection. The system shall also incorporate the use of insensitive lead-in cables.

The fiber optic intrusion detection system shall function as a perimeter intrusion detector. The multimode fiber optic sensor cable shall be designed for encasement in flexible conduit and mounting on a perimeter fence or wall. The basic system shall consist of the fiber optic sensor cable, insensitive lead-in cables, flexible conduit, and a single-zone processing unit.

The system shall provide intruder detection on various types of fencing such as chain link, expanded-metal, or welded-mesh fabric.

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. These actions are characteristic of an egression of a fence barrier in any of the following manners: fence climbing, post climbing, cutting, digging at the base of a fence, lifting of fence fabric, ladder assisted vaulting, or other fence contact bridging methods.

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 RJ45 interface depending on requirements of the alarm monitoring system.

* + - 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 acting on the fence. The processor shall use adaptive 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 (16,400 feet).

The PU shall support insensitive lead-in cable lengths of up to 20 kilometers meters (12.4 miles).

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 processor channels - Processor 1 (“Climb”) and Processor 2 (“Cut”) - 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 shall be made of glass and not plastic. 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, direct burial applications, fences, non-metallic flexible or rigid conduits, under roof material, and in concrete or stucco finishes.

* + - * 1. Laser Monitoring

Each processor 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

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

System:

Gain (overall system sensitivity)

Allow wind-dependent processing

Alarm relay duration

Tamper switch enable/disable

Processor 1: (climb detection)

Enable/disable

Level of signal

Lowest frequency

Highest frequency

Duration of signal

Low level tolerance

Event count

Event window

Event mask time

Processor 2: (cut detection)

Enable/disable

Level of signal

Lowest frequency

Highest frequency

Duration of signal

Low level tolerance

Event count

Event window

Event mask time

Software-based Wind Dependent Processing

Enable / disable

Wind compensation variable adjustment

* + - * 1. Perimeter Maximum Sensor Cable Length

Each PU alone will be capable of supporting 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 and deployed in a “loopback” configuration.

* + - 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 of not less than 0.95 at the 90 percent level of confidence.

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.

Inappropriate testing for the security level or procedures, and test results not documented or approved by the manufacturer for the installation, shall be given no credence.

* + - * 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 fence 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 those alarms for which no cause can be immediately determined but later prove to be caused by something other than intrusion. In this case it will refer to those alarms generated by a properly functioning processor and attached sensor due to an internal processing error.

The maximum allowable False Alarm Rate (FAR) for a processor 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: 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 be operate as specified when installed properly to the manufacturer’s recommendations in outdoor environments. The system shall be installed in such a manner as to minimize the Nuisance Alarm Rate (NAR) from the following possible causes:

Precipitation

Seismic activity acting on the fence from nearby trains or heavy vehicle traffic near the fence line.

Windblown objects

Vegetation, including trees, shrubs, or extremely long ground cover striking the fence at intermittent intervals as the result of wind may cause nuisance alarms. These potential sources shall be trimmed, cut, or otherwise prevented from contacting the fence.

Fence Vibration

Fence-mounted signs and other loose materials or fence hardware shall be secured in place or removed as needed to prevent banging against the fabric or moving it. The fence fabric shall be consistently taut throughout the perimeter.

Any site specific concern, or any unusual application or condition that may lead to an unacceptable false or nuisance alarm rates 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. The sensor cable shall be installed in non-metallic flexible conduit along its entire run on the fence. This sensor/conduit combination shall be attached to the fence by stainless steel wire ties, spaced approximately 12 to 14 inches apart.

* + - * 1. Sensor Cable Types

The sensor cable shall be available in the following configurations:

Simplex-fiber sensor cable in a 3-millimeter outdoor cable installed in conduit suitable for direct attachment to fences.

* + - * 1. Cable Lengths

Sensor cable is available in any length up to 2000 meters (6500 feet).

* + - * 1. Zone Lengths

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

* + - * 1. Fence Material

The factory shall be consulted if fence materials other than chain link, expanded metal, welded-mesh fabric, or wrought iron decorative fence are to be used. The factory shall be consulted if the fence height is comprised of any material other than chain link, expanded metal, decorative wrought iron, or welded mesh.

* + - * 1. Fence Height

The following configurations are for comparison only. The factory shall be consulted for actual layout configurations for any fence in excess of 12 feet in height. Layout of the sensor cable is strongly influenced by the security level desired, and should be designed accordingly. Contact the factory for assistance with high-level security design layouts.

A chain link fence comprised of hot-dipped galvanized steel, or steel with an electroplated applied coating, shall be 7 feet tall for a minimum single run of sensor cable mounted at the mid-point of the fence.

For the same fence material of 8 to 15 feet in height, a double run, or “loopback” configuration, shall be used, with mounting heights spaced from the top and bottom equal to one-fourth of the total fence height.

For the same fence material in excess of 15 feet in height, a triple run or double loop configuration shall be used, with mounting heights equally spaced from top, center, and bottom equal to one-third of the total height.

* + - * 1. Conduit

Conduit protection has proven to extend the useful life of all sensor cables, and shall be used for both physical protection and facilitation of quick and easy sensor cable maintenance.

The conduit shall be supplied in a split or solid construction of UV-resistant, linear low density polyethylene (LLDPE).

Each 3-millimeter sensor cable shall be physically protected by conduit along its entire path on the fence.

All sensor cable and wiring running between the PU and the fence shall be protected by conduit. Special attention to protection shall also be given to the point at which the cable(s) enter and exit the ground, regardless of sensor type or application.

1. PRODUCT
   * + 1. ALARM PROCESSOR and SENSOR CABLE SPECIFICATIONS
          1. Processing Unit (PU)
          2. Each PU and sensor shall conform to the following specifications as a minimum.

Each Processing Unit (PU) shall support 1 zone up to the maximum allowable sensor length of 5000 meters (16,400 feet). Each PU shall also support up to 20 km (12.4 miles) of insensitive lead-in cable on the input and output connectors.

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 placed in an environmental enclosure and mounted on the fence fabric, on a fence post of the perimeter, on a post set away from the fence, or in a nearby building. Both signal and power wiring must be brought to the enclosure. The required use of insensitive lead-in cable shall allow the distance between the PU and sensor cable to extend up to 20 km (12.4 miles).

Sensor cable not attached to fence (either routing to or from the remotely-mounted PU) shall be buried in conduit at a 1 ½ -foot depth to eliminate nuisance alarms.

If 3-mm sensor cable is being used, it shall be protect in rigid non-metallic conduit along its entire run to and from the fence line.

If 4-mm sensor cable is used, it may be buried directly or inserted in protective conduit as described in “2” above, which is the preferred method for short runs.

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

No single PU failure shall cause any other PU along the perimeter to stop functioning in a normal manner.

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. The alarm relay shall activate when an intrusion alarm is generated, a fault condition exists, or the tamper input is activated. Loss of power to the PU shall result in an alarm condition.

* + - * 1. Alarm 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 front ends via the PU’s RJ45 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 value.

* + - 1. SYSTEM CALIBRATION
         1. It shall be possible to adjust the alarm processor calibration parameters listed in Section 1.05A using a standard portable Windows-based personal computer with an ASCII terminal emulator utility.
         2. Access to the PU calibration port shall require that the enclosure be opened, which will trigger a tamper alarm.
         3. 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 processor's circuitry.
      3. STAND-ALONE PU ELECTRICAL SPECIFICATIONS

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

|  |  |
| --- | --- |
| Voltage | 12 to 24 Vdc |
| Power | 3 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.

|  |  |
| --- | --- |
| Stand-alone Operating 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. 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 SENSOR CABLE SPECIFICATIONS

Each sensor cable shall conform to the following specifications as a value or range by type.

|  |  |
| --- | --- |
| Specification | 3 mm cable |
| Cable Outer Jacket | Polyurethane, UV-Resistant, Flame Retardant |
| Connector Pull Strength | 5 pounds |
| Outside Diameter | 3 mm (0.12 inches) |
| Max. Tensile (Operation) | 200 N (45 lbs.) |
| Max. Cable Pull (Install Tensile) | 300 N (60 lbs.) |
| Minimum Bend Radius | 2.5 cm (1 inch) |
| Operational Temperature Rating | 40°C to +85°C (40° F to 185° F) |
| Optical Connection | ST Standard |
| Max. Cable Length/Zone | 5000 m (16,400 feet) |
| Outer Jacket Material | Polyurethane |
| Color | Brown |

* + - 1. INSENSITIVE FIBER OPTIC LEAD-IN CABLE Requirements

A Single-mode fiber cable that meets or exceeds the System manufacture recommendations. Cable characteristics should include: Outdoor rated, Direct Burial deployment and Low Bend Radius loss.

* + - 1. SYSTEM AVAILABILITY

A product meeting or exceeding this specification is manufactured by:

Fiber SenSys

2925 NW Aloclek Drive, Suite 120

Hillsboro, OR 97124 USA

TEL: +1-503-692-4430

FAX: +1-503-692-4410

E-mail: info@fibersensys.com

http: www.fibersensys.com

1. EXECUTION
   * + 1. TESTING, GUARANTEE, AND SERVICE
          1. The local service organization servicing the warranty period for the above equipment shall become certified in its use before installation of the equipment.
          2. 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.
          3. Any equipment shown defective in workmanship or material shall be repaired, replaced, or adjusted free of charge.

END OF SECTION