SECTION 28 16 43  
  
Perimeter intrusion detection system

Fiber optic – fence detection

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 outdoor fence perimeter intrusion detection system.
          2. The perimeter 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 us a multimode fiber optic sensor with multi-channel DSP processor designed and configured for fence line intrusion detection.

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

Software shall be provided that reduces nuisance alarms cause by wind, for use in locations that experience windy conditions.

The system shall provide intruder detection for perimeters with chain link fence.

The system shall detect vibrations caused by an intruder that is cutting, climbing, or lifting the fence fabric.

The system shall be capable of stand-alone operation. The system shall also be capable of integrating itself into a security management system by providing alarm relay contact outputs, an <RS-232> interface, and an XML interface.

The performance criteria required for this project shall meet or exceed that of a perimeter intrusion detection 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. Processing Unit

The Processing Unit (PU) shall analyze the signals from the fiber optic sensor cable and shall detect vibration of the fence. The processor 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 processor shall support a total sensor cable length of up to 500 meters (1640 feet).

Signal Processing Algorithms

The system shall use digital signal processing and adaptive algorithms capable of adjusting the performance to specific fence and environmental conditions. The PU shall have two parallel processor channels – “Climb” and “Cut” – where a separate calibration is allowed for either processor providing detection for two distinctly different intrusion scenarios. Either processor may be turned enabled or disabled. If they are both enabled, they are logically “or” gated so that an alarm will occur if the conditions for either the “Climb” processor or “Cut” processor 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 approved for use by the equipment manufacturer.

* + - * 1. Laser Monitoring

Each processor shall monitor the returning laser power and generate a “Fault” alarm if the cable is cut.

* + - 1. SYSTEM PARAMETERS
         1. Processor Adjustments

Each processor channel shall have the following adjustments, menus, or entries available for tuning and setting up the system.

SETUP:

Climb

Enable/disable processor

Climb sensitivity (0 to 50)

Event count (1 to 10)

Lowest frequency (Hz 10 to 600)

Cut

Enable/disable processor

Cut Sensitivity (0 to 50)

Event count (1 to 10)

Lowest frequency (Hz 10 to 600)

Wind

Wind Rejection (20 to 80)

Enable Wind Processor (E or D)

ADMIN

Output

Enable/disable tamper switch

Alarm Relay Time (1 to 10 sec)

Comment – to be entered by user

Setup Date – to be entered by user

HIST – Read Only – Alarm history (cut or climb, time)

STATUS – Read Only – System light loss (dB), laser current, power supply voltage

VERSION – Read Only – Model Number, Serial Number, Mfg. Date, Firmware Version, Days of Operation.

* + - * 1. Perimeter Maximum Sensor Cable Length

Each Processing Unit shall be capable of supporting up to 500 meters (1640 feet) of sensing fiber optic cable per zone. Multiple processors shall be capable of protecting a perimeter of arbitrary length.

* + - 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 for non-stealthy intrusions

A properly installed system shall be capable of achieving a Probability of Detection (PoD) rate of at least 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 Processing Unit, sensor cable configuration and fence quality.

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-to-medium 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 “Processor Adjustments” above.

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) I changed this section to match the other Templates

Nuisance alarms are defined as those alarms generated by a properly functioning processor and attached sensor, 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) from the following possible causes and corrections:

Precipitation

Seismic activity acting on the fence

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.

Wind-blown 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 an 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 inches (30 centimeters) apart.

* + - * 1. Sensor Cable Types

The sensor cable shall be available in the following configurations:

Single-fiber sensor in a 4 millimeter (OD) cable used for fence line applications.

* + - * 1. Cable Lengths

Sensor cable is available in 250 or 500 meter lengths.

* + - * 1. Zone Lengths

Zone lengths shall be either 100 meters / 200 meters or customized 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 or welded mesh are to be used.

* + - * 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 higher-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 facilitations of quick and easy sensor cable maintenance.

The sensing cable shall be supplied pre-installed in flexible UV resistant conduit.

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 Processing Unit 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. Processor

Each processor and sensor shall conform to the following specifications as a minimum.

Each Processor shall support 2 zones, each configured with up to the maximum allowable sensor length of 500 meters (1640 feet).

The processor 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 using multiple processors.

The processor shall provide an internally maintained alarm record of the latest 128 alarm events. The processor circuitry shall be protected from lightning or other voltage surges on all wired connections.

* + - * 1. Processor Mounting

The processor may be mounted in an enclosure that is attached to the fence fabric, a fence post of the perimeter, or on a post set away from the fence. The Processing Unit may also be mounted in a nearby building. Both signal and power wiring (if hardwired) must be brought to the Processing Unit.

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

The fiber-optic sensing cable shall be protected in rigid non-metallic conduit along its entire run along the fence line.

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

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

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

A separate alarm relay output shall be provided from a 100 mA, 24 VDC Form “C” relay, with normally-open and normally-closed contacts for both Processing Unit zones/channels. The alarm relays shall activate when an intrusion alarm is generated, a fault condition exists, or the tamper input is activated for either zone/channel.

* + - * 1. The processor shall provide an RJ45 connector for IP communications via XML protocol.
      1. LASER OUTPUT MONITORING

The LASER level output shall be monitored at the receiver end and a fault condition shall be reported if the cable is cut.

* + - 1. SYSTEM CALIBRATION
         1. All system performance variables described in Section 1.05 of this document shall be adjusted with simple-to-use tuning software.
         2. It shall also be possible to use the tuning software with a standard portable Windows-based personal computer.
         3. It shall be possible to install the Processing Unit in such a manner that access to the processor calibration port shall require that the enclosure be opened, which will trigger a tamper alarm.
      2. PASSWORD PROTECTION

Each Processing Unit 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.

* + - 1. ELECTRICAL SPECIFICATIONS

Each processor 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 | 0.1 Amp, 24 VDC Non-inductive |
| Contact Isolation | 250 VAC |
| Serial Port | RS-232C |
| IP Port | RJ45 |
| External Tamper Switch rating | 5VDC @ 1ma, min. Closed circuit = secured state |

* + - 1. ENVIRONMENTAL SPECIFICATIONS

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

|  |  |
| --- | --- |
| Temperature | -40°C to 70°C (40°F to +158°F) |
| Humidity | 0 to 90% Non-condensing |

* + - 1. PHYSICAL SPECIFICATIONS

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

* + - * 1. Enclosure (Optional equipment from the manufacturer)

The enclosure shall consist of fiberglass polyester NEMA EEMAC Type 4X, and shall conform to UL 508 TYPE 4X and CSA Enclosure Type 4 and 5 standards, with an enclosure flammable rating of UL94 5V.T.

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

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

|  |  |
| --- | --- |
| Specification | 3mm cable |
| Cable Outer Jacket | Polyurethane, UV-Resistant,  Flame Retardant |
| Connector Pull Strength | 5 pounds |
| Outside Diameter | 3mm (0.12 inches) |
| Max. Tensile (Operation) | 200 N (45 lbs.) |
| Max. Cable Pull (Install Tensile) | 300 N (60 lbs.) |
| Minimum Bend Radius | 2.5cm (1 inch) |
| Operational Temperature Rating | -40°C to +85°C  (-40°F to 185°F) |
| Optical Connection | ST Standard |
| Max. Cable Length/Zone | 500m (1640 feet) |
| Outer Jacket Material | Polyurethane |
| Fiber type | Multimode |

* + - 1. SYSTEM AVAILABILITY

A product meeting or exceeding this specification is the 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 system shall be free from defects in workmanship and materials, under normal use and service, for a period of one year 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