Architectural and Engineering Specification for a Fiber Optic Perimeter Intrusion Detection System

FiberPatrol FP1100X™

This document is intended to provide performance specifications and operational requirements for the FiberPatrol FP1100X fence-mounted perimeter intrusion detection system. It is written in a generic format. These specifications may be copied verbatim to form a generic procurement specification.

PART 1 GENERAL

1.1 System Summary

The contractor shall install a ranging, fence-mounted perimeter intrusion detection system (PIDS). The system shall detect and locate intruders that attempt to cut, climb, or lift the fence fabric.

The detection sensors shall consist of fiber optic cables. The cables shall connect to a signal processing module that detects and locates attempted intrusions by analyzing the changes in reflected energy that occur as a result of minute vibrations in the sensor cables.

If a sensor cable is cut, the system shall retain detection and locating capabilities in the portion(s) of the sensor cable that remain connected to the sensor unit. When using a single sensor unit, it shall be possible to install the system in a cut-immune configuration such that the system remains fully operational after a single cable cut.

The system shall be capable of being integrated into the facility's Security Management System.

1.2 Submittals

A. Contractor submittals to the facility owner shall include the following as a minimum:

1. Site conditions report as per article 3.1
2. Configuration and calibration settings for the system after installation and calibration are complete as per article 3.3
3. All manufacturer-supplied software required for the calibration and operation of the system.
4. Documentation providing system operation and maintenance procedures.

1.3 Qualifications

A. The manufacturer of the system shall have a minimum of five (5) years' experience in the last 10 years of the manufacture and successful implementation of similar systems.

1.4 Spares

A. The contractor shall deliver to the facility owner spare system components.

B. For each system component, spares consisting of least one unit or 10% of the number that comprise the system, whichever is greater, shall be provided.

1.5 Warranty

A. The product shall be under warranty for a minimum of three years from the date of purchase.

B. The supplier shall repair or make equivalent parts available for a minimum of 10 years from the date of purchase, based on a site's original equipment ship date.

1.6 References

A. Abbreviations and acronyms: The following acronyms and abbreviations are used in this document:

1. PIDS: Perimeter Intrusion Detection System
2. MTBF: Mean Time Between Failures
3. MTTR: Mean Time To Replace
4. OTDR: Optical Time-Domain Reflectometer
5. Pd: Probability of Detection

B. Reference Standards: The following regulatory and industry standards are referenced in this document:

1. Federal Communications Commission: FCC CFR Part 15, Subpart B requirements for Class A devices.
2. Conformité Européenne (CE)

PART 2 PRODUCTS

2.1 Fence-Mounted Perimeter Intrusion Detection System

A. The contractor shall supply a ranging, fence-mounted perimeter intrusion detection system (PIDS).

B. The fence-mounted PIDS shall detect and locate intruders attempting to breach the perimeter fence by cutting, climbing, or lifting the fence fabric.

C. The fence-mounted PIDS shall support a cut-immune deployment configuration that enables the system's detection and locating capabilities to remain fully operational in the event of a sensor cable cut.

2.2 Manufacturers

A. The FiberPatrol™ FP1100X system from Senstar Corporation (www.senstar.com) meets the requirements stated in this document.

2.3 Regulatory Requirements

A. The system shall comply with the following regulations:

1. FCC 47 CFR Part 15, Subpart B requirements for Class A devices
2. CE

2.4 Mechanical Requirements

A. Sensor cable:

1. The sensor cable shall have the option to be encased in an armor jacket, for use in areas that have a high potential of physical damage to the cable.
2. The sensor cable shall have a minimum bend radius no greater than 15 cm (6.0 inches).
3. The sensor cable shall be affixed to the facility's fence through the use of UV- resistant plastic or metal cable ties.
4. The sensor cable shall not require a cable conduit to be installed along the fence perimeter to protect the cable.
5. The sensor cable shall be able to include additional, unused fibers for use by other equipment (such as for data or video communications).
6. The sensor cable shall include no conductive elements.
7. The sensor cable shall be intrinsically safe within explosive atmospheres.
8. The sensor cable shall be completely immune to all forms of electromagnetic energy from radio communications, radar, electrical power transmission equipment and lightning.

9. The fence-mounted PIDS shall be capable of being used with standard commercially-available fiber optic cable that meets the requirements identified above.

B. Sensor unit equipment:

1. The system shall not require any active devices or processor modules to be installed outdoors.
2. All active components shall be rack-mountable in an indoor, equipment room environment
3. The indoor system components shall be designed for a standard 19-inch wide rack.
4. The system shall provide the option for a slide-out monitor and keyboard that enables local console access to the system.
5. The system shall include a fiber optic patch panel for interfacing the sensor cable to the processor and controller modules.

2.5 Environmental Requirements

A. The sensor cables shall be able to operate in temperatures from –40°C to 70°C (–40°F to 158°F) and a relative humidity of 0 to 100% (condensing) without performance degradation.

B. The sensor unit components shall be designed for indoor use and meet the following requirements:

1. Temperature:
   a. Operating: 10 to 35 °C (50 to 95 °F)
   b. Storage: –20 to 70 °C (–4 to 158 °F)
2. Humidity:
   a. Operating: 20% to 80% (relative, non-condensing)
   b. Shipping and storage: 5% to 85% (relative, non-condensing)

2.6 Reliability and Maintenance Requirements

A. Sensor cables: The sensor cables shall have a nominal service life of 20 years, excluding damage caused by non-environmental forces.

B. Sensor unit:

1. The sensor unit modules shall have a predicted mean time between failures (MTBF) of greater than 87,000 hours.
2. The sensor unit shall be capable of performing internal self-diagnostic tests of the internal circuitry, cable continuity, and detection processing.
3. The sensor unit software shall be field-upgradeable.

2.7 Electrical Requirements

A. Each sensor unit shall meet the following electrical requirements:

1. Input power: 100 to 240 VAC, 50/60 Hz
2. Power consumption: Less than 250W

B. Backup power: The sensor unit shall be capable of being powered from a third-party Uninterruptable Power Supply (UPS) or standby generator.

C. The system shall not require any outdoor power or grounding connections.

2.8 Detection Capabilities

A. The sensor shall consist of fiber optic cable that is attached to the fence along the full length to be protected.

B. The system shall provide two independent sensing channels.

C. The system shall be able to detect and locate intrusions over a cable distance of up to 50 km (31 mi) when the two sensing channels are used independently.

D. The system shall be able to detect and locate intrusions over a cable distance of up to 25 km (15.5 mi) when the system is deployed in the cut-immune configuration.

E. The sensor unit shall have the following detection capabilities:

1. Process the signal from the sensor cable to detect intruders attempting to breach the perimeter fence by cutting, climbing, or lifting the fence fabric
2. Locate the position of a detected intrusion within 4.0 m (13 feet) or less at least 95% of the time.
3. Detect multiple simultaneous intrusions, when each intrusion attempt is separated by a sensor cable distance greater than 45 m (150 feet).
4. Support up to 1440 virtual detection zones.
5. Be capable of being calibrated to function on different types of metal fencing.
6. Utilize adaptive algorithms in the detection process to optimally discriminate between actual intrusions and environmental activity.

F. Intrusion detection performance:

1. The probability of detection (Pd) of an intruder cutting the fence, lifting the fence fabric, or climbing unaided over the fence shall be 95% with a 95% confidence factor, when the system is installed in accordance with the manufacturer's directions on a high-quality fence.
2. False alarm rate: The maximum rate for alarms generated by the internal electronic processes of the processors (cables excluded) shall be less than one per zone per year, averaged over the total number of zones in the system.

3. Nuisance (environmental) alarms:
    a. The system when calibrated according to manufacturer's guidelines shall not suffer nuisance alarms from any of the following sources:
        .1 Temperature changes
        .2 Motion of nearby objects or vegetation that are not striking the fence
        .3 Motion of surface or ground water
        .4 Sunrise/sunset
        .5 Acoustic or magnetic effects
        .6 Snow
        .7 Fog
        .8 Seismic vibration caused by nearby vehicular traffic
        .9 Seismic vibration caused by nearby rail traffic when the fence is further than 5 m (16 feet) from the rails.
    b. The system shall utilize advanced processing and ambient compensation to minimize the probability of nuisance alarms from the following sources:
        .1 Wind
        .2 Rain and hail
        .3 Sandstorms

G. Time to detection:
    1. The system shall be capable of generating an alarm within one second from the onset of an attempted breach that involves aggressive contact with the system (such as one attempted by quick climbing).
    2. Other detected intrusion attempts shall be reported no later than one second after the breach is completed.

H. Fence compatibility:
    1. The system shall support installation on the following types of metal fencing:
        a. Chain-link
        b. Expanded metal mesh
        c. Welded mesh
        d. Concertina and/or razor wire
        e. Vinyl-coated chain-link
        f. Palisade-style fences

2. It shall be possible to use multiple passes of sensor cable to obtain the specified detection performance for fences of any height.
3. The manufacturer shall provide installation guidelines regarding the type and height of fences that can be protected with one, two, and multiple passes of sensor cable.

I. Gate compatibility: The sensor cable shall be capable of being installed on swinging gates.

2.9 Cable Cut Response

A. The system shall support a closed-loop cut-immune configuration that enables the system's detection and locating capabilities to remain fully operational in the event of a sensor cable cut.

B. The system shall be capable of detecting and locating a sensor cable cut.

C. The cut location shall be determined and reported with an absolute accuracy of equal to or less than 30 m (100 feet).

D. In the event of a sensor cable cut, the system shall retain detection and locating capabilities in the portion(s) of the sensor cable that remain connected to the system sensor unit.

2.10 Installation and Configuration Capabilities

A. The system shall have the following characteristics, as a minimum:

1. The sensor cable shall be capable of being attached directly to the fence without needing to be put in a conduit.
2. The sensor cable shall be capable of being attached to the fence with standard UV-resistant cable ties (plastic or metal).
3. The system shall support the use of non-sensing, "lead in" cable as long as the total length of cable does not exceed 25 km (15.5 miles) per sensor channel.

B. The system shall support the following configuration and calibration features:

1. A Windows-based graphical user interface (GUI).
2. Configuration and calibration settings shall be capable of being stored in a computer file for record keeping purposes and available for reuse when configuring additional or replacement processors.

2.11 Networking Capabilities

A. Network manager tools: The system's network management software shall provide the following tools to facilitate system commissioning and trouble-shooting:

1. System status tool that provides a visual display of the status of all processors in the system

2. System event log tool that provides a searchable log of system events.

B. The system shall support an Ethernet RJ-45 connector as a physical media option for communication with the integrated sensor network.

C. Network management:

1. The system shall include network management software to manage the communications over the sensor network. The network management software shall be capable of running on a standard Windows PC as well as on the sensor unit itself and be accessible via Windows Remote Desktop.

2. The system's network management software shall provide a TCP/IP-based interface for communicating alarm, status, and configuration data to and from security management systems. The system supplier shall furnish complete documentation of this interface to facilitate integration with security management systems.

2.12 Event Management

A. The system shall provide a local PC-based operator interface with graphical alarm annunciation at the sensor unit.

B. The system shall provide access to the following information and functionality when in a local or networked configuration:

1. A user-configurable image depicting the protected site with a schematic perimeter overlay

2. Hardware monitoring and control

3. Event detection and alarm generation (including flashing notification message, location marker, and audible alert)

4. Basic alarm management

5. Event and alarm logging

6. Detection zone definition and configuration

7. Adjustment of detection parameters

C. The system shall support the following alarm management functions:

1. Maintain complete information on all alarms for 24 hours or until the alarm is cleared.

2. Alarms shall be cleared by local or remote operator or automatically in 24 hours after alarm generation.

3. Until cleared, the alarm information shall be compiled in a scrollable multi-column table.

4. The maintained information shall include:

a. Unique alarm ID number

b. Time label

c. Event duration

d. Event status

e. Event strength

f. Event location

5. The operator shall be able to:

   a. Select any of the alarms from the list.

   b. Enter text notes regarding the cause of the alarm and the mitigation measures.

   c. Clear the alarm.

6. Operator notes as well as the alarm clearing event shall be recorded in the event log.

7. Alarm location format:

   a. The primary format of the alarm location shall be the linear position along the sensor cable

   b. It shall be possible to express the alarm location in either meters or feet

   c. Secondary location formats shall be derived from the primary measure using appropriate calibration tables.

   d. Secondary location formats shall require corresponding mapping of the perimeter fence line.

   e. It shall be possible to provide secondary alarm location formats including:

      .1 Software-defined zones

      .2 Latitude and longitude (GPS) coordinates

8. Event logging:

   a. The system shall maintain and display an event log, including alarms, system notifications, and user actions.

   b. The logs shall be periodically saved to the hard drive.

   c. A new set of log files shall be generated every 24 hours at midnight

2.13 Access Control

A. The system shall require the entry of a valid password at start-up and shutdown.

B. The system shall divide user access into three security levels:

1. Operator level for routine operation
2. Supervisor level for advanced system monitoring, configuration, and troubleshooting
3. Installer level for advanced configuration and troubleshooting.

PART 3 EXECUTION

3.1 Site Assessment

A. Before installation begins, the installation contractor shall provide a report to the facility's owner documenting any site conditions that may prevent the system from operating satisfactorily. Examples of such conditions include loose fence fabric, loose gates, or objects such as signs or tree branches hitting the fence.

3.2 System Installation

A. The system shall be installed in accordance with the manufacturer's recommended procedures as defined in the manufacturer's documentation for the system.

3.3 System Calibration

A. The installation contractor shall calibrate the system in accordance with the manufacturer's recommended procedures as defined in the manufacturer's Product Guide.

B. The installation contractor shall submit to the owner the calibration and configuration settings for the system.

3.4 Training

A. The installation contractor or vendor shall train the owner's maintenance personnel in the calibration and system maintenance procedures as given in the manufacturer's product documentation.