

**Architectural and Engineering Specification for a
Real-Time Locating System
Flare™**

This document is intended to provide performance specifications and operational requirements for the Flare Real-Time Locating System. It is written in a generic format. These specifications may be copied verbatim to form a generic procurement specification.

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PART 1 GENERAL

1.1 System Summary

The contractor shall install a Real-Time Locating System (RTLS). The system shall be used to identify and locate personnel under duress in potentially high-risk situations (e.g. those in correctional, medical, or industrial environments).

The system shall consist of a lightweight, wearable duress transmitter that communicates over radio frequency (RF) with receivers distributed throughout the building or complex. Optionally, a fixed position duress transmitter can be incorporated into the system.

A duress alarm shall be initiated by pressing a button on the duress transmitter. The transmitter shall also initiate an alarm when a low battery condition is detected

The transmitter shall be available in a version that initiates a duress alarm when a pin attached to a lanyard is pulled out or when the duress transmitter is tilted beyond a specified angle for a specified period of time (man-down feature).

The system shall provide a software interface in which duress alarms can be communicated to operations staff and displayed on user-configurable maps.

1.2 Submittals

- A. Contractor submittals to the facility owner shall include the following, as a minimum:
 - 1. Site conditions report as per part 3.1
 - 2. Site specific database based on approved architectural drawings.
 - 3. Configuration and test results for the system after installation and calibration are complete as per part 3.3
 - 4. All manufacturer-supplied software required for the maintenance and operation of the system.

1.3 Spares

- A. The contractor shall deliver to the facility owner spare system components.
- B. For each system component, spares consisting of at least one unit or 3% of the number that comprise the system, whichever is greater, shall be provided.

1.4 Warranty

- A. The product shall be under warranty for a minimum of three years from the date of purchase.
- B. The manufacturer shall make available replacement components, parts or assemblies for a minimum of ten years from the date of purchase.

1.5 References

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

CAD: Computer-Aided Design

CSA: Canadian Standards Association

DC: Direct Current

PoE: Power-over-Ethernet

RTLS: Real-Time Locating System

RF: Radio Frequency

UL: Underwriters Laboratories

UPS: Uninterruptable Power Supply

IEEE: Institute of Electrical and Electronics Engineers

PART 2 PRODUCTS

2.1 Real-Time Locating System

- A. The contractor shall supply a Real-Time Locating System (RTLS).
- B. The system shall consist of:
 - 1. Lightweight, low power, wearable duress transmitter, one per staff member, that communicate over RF with receivers distributed throughout the building or complex. The wearable duress transmitter shall be available in both belt-holster and compact versions.
 - 2. Low power fixed position duress transmitter which can be mounted on a wall or post, which communicates over RF with receivers distributed throughout the building or complex.
 - 3. RF receivers distributed throughout the building or complex that communicate by RF with the wearable and fixed position duress transmitter.
 - 4. A software application that alerts operators of received alarms and can display alarms and alarm location on user-configurable maps.
 - 5. A network of Ethernet switches with PoE support that provides communication and power to the RF receivers.

2.2 Manufacturers

- A. The Flare RTLS from Senstar Corporation (www.senstar.com) meets the requirements stated in this document.

2.3 Regulatory Requirements

- A. The RTLS shall be registered with a nationally registered testing laboratory such as CSA or UL.
- B. All equipment shall carry the appropriate registration label(s).
- C. The RTLS shall operate within a licensed frequency band (450 to 470 MHz) that will not be shared by other RF equipment at the same location.
- D. The RTLS shall not operate within the unlicensed bands in the United States, or in similarly unregulated bands within other countries.
- E. The RTLS equipment shall carry the appropriate RF registrations for use in the country where it will be installed.

2.4 Manufacturing Quality Requirements

- A. The manufacturer's quality management system shall be certified as conforming to ISO 9001:2008.

2.5 Mechanical Requirements

- A. Wearable duress transmitter (belt-holster version):
 - 1. The dimensions shall be equal to or less than 12 x 5.0 x 2.5 cm (4.7 x 2 x 1 in).
 - 2. The weight shall be equal to or less than 200 g (7 ounces) (including battery).
 - 3. Durability: Other than for cosmetic damage, the device shall not be damaged or malfunction after six drops onto a tiled floor from a height of 1.5 m (5 ft) with one drop on each of the six sides on three orthogonal axes.
 - 4. The device enclosure shall have a tamper-resistant construction.
 - 5. The device shall include a ruggedized belt-holster.
 - 6. The device shall include an option for a lanyard with pull-pin.
- B. Wearable duress transmitter (compact version):
 - 1. The dimensions shall be equal to or less than 8.4 x 5.3 x 1.9 cm (3.31 x 2.09 x 0.75 in).
 - 2. The weight shall be equal to or less than 53 g (1.9 oz) (including battery).
 - 3. The device shall be attachable to a tear-away neck lanyard, a lanyard, or clip designed for belt-mounting.
 - 4. The device shall include a tear-away neck lanyard and clip.
- C. Fixed position duress transmitter:
 - 1. The dimensions shall be equal to or less than 13.0 x 9.4 x 8.9 cm (5.1 x 3.7 x 3.5 in).
 - 2. The fixed position duress transmitter's enclosure shall have a tamper-resistant construction.
- D. RF receivers:
 - 1. The dimensions shall be equal to or less than 25.4 x 15.2 x 7.6 cm (10.0 x 6.0 x 3.0 in)
 - 2. The RF receiver enclosure shall include mounting flanges to facilitate its installation on a wide variety of surfaces.
 - 3. The RF receiver shall have the option of using external antennas for increased range.
 - 4. The RF receiver shall accommodate the use of tamper-resistant screws.

2.6 Electrical Requirements

- A. Wearable and fixed position duress transmitters:
 - 1. The duress transmitters shall be powered from the following commercially available, field-replaceable batteries:
 - a. Belt-holster version: 9V DC non-rechargeable battery
 - b. Compact version: Two CR2025 non-rechargeable batteries
 - c. Fixed position version: 9V DC non-rechargeable battery.
 - 2. Battery shall be replaceable by the user or system administrator.
 - 3. The wearable and fixed position duress transmitter device shall automatically report a low battery condition to the operator's alarm notification system.
 - 4. Under normal operating conditions (3 test transmissions per day), the duress transmitter device battery shall have the following minimum lifetime before a low battery condition is reported:
 - a. Belt-holster version: 1 year
 - b. Pendant version: 6 to 8 months
 - c. Fixed position version: 1 year.
 - 5. The duress transmitters shall be capable of operating normally for the following number of days following the initial reporting of a low battery condition:
 - a. Belt-holster version: 7 days
 - b. Compact version: 7 days.
- B. RF receivers:
 - 1. The RF receiver shall use antenna diversity to maximize system accuracy by utilizing the RF information from two internal antennas on different planes.
 - 2. The RF receiver shall consume 1.2 watts of power or less.
 - 3. The RF receivers shall be powered via minimum Class 1 Power-over-Ethernet (PoE) as per IEEE 802.3af.
 - 4. The RF receivers shall be connected to a dedicated IP network.

2.7 Environmental Requirements

- A. The wearable and fixed position duress transmitter shall operate within specifications under the following environmental conditions:
 - 1. Operating temperature: -20°C to 60°C (-4°F to 140°F)
 - 2. Water resistance: The wearable duress transmitter shall not malfunction after being exposed to 30 seconds of heavy rain.
 - 3. Humidity: 0 to 90% non-condensing.
- B. The RF receivers and other installed devices shall operate within specifications under the following environmental conditions:

1. Operating temperature: -20°C to 60°C (-4°F to 140°F)
2. Humidity: 0 to 90% non-condensing.

2.8 RF Requirements

- A. The RTLS shall operate in licensed bands as to avoid potential interference.
- B. The RTLS shall support the Public Safety band, 450 to 470 MHz.
- C. It shall be possible to configure the RTLS to operate at any of a number of frequencies within the approved band in order to avoid RF interference.
- D. The option shall exist for external antennas to be used in order to increase the coverage area.
- E. The option shall exist for external antennas to be mounted outdoors and connected with an RF cable to the RF receiver which will be located indoors.
- F. The RF signal shall not be blocked by common building materials, smoke, the human body, or heavy clothing.

2.9 Performance Requirements

- A. The RTLS shall support transmissions up to the following distances when the wearable duress transmitter has a line-of-sight with an RF receiver equipped with an external antenna:
 1. Belt-holster version of duress transmitter: 1.0 km (0.6 mi)
 2. Compact version of duress transmitter: 0.5 km (0.3 mi).
- B. The RTLS shall support at least 10 alarms within a 10 second time period.
- C. In fully enclosed structures, where floors and rooms are completely delimited by concrete and steel materials, the RTLS shall provide accurate wearable duress transmitter locations to the correct floor of a building, on the correct side of an exterior wall, and within the defined locating accuracy, with a minimum success rate of 95%, averaged over the entire site.
- D. Location Accuracy:
 1. Indoor Alarms:
 - a. RTLS shall have a best-case indoor locating accuracy of 6 m (20 ft) when the belt-holster version of the wearable distress transmitter is used, with accuracy dependent on building construction and Flare system deployment design.
 - b. RTLS shall have a best-case indoor locating accuracy of 9 m (30 ft) when the compact version of the wearable distress transmitter is used, with accuracy dependent on building construction and RTLS system deployment design.
 - c. In a large open interior area, the RTLS shall locate alarms to the large open interior area or within the defined locating accuracy.
 2. Outdoor Alarms

- a. RTLS shall have a best-case outdoor locating accuracy of 30 m (100 ft) line-of sight, with accuracy dependent on building construction, site layout, and RTLS system deployment design.
- E. The wearable distress transmitter location accuracy shall be qualified through a predefined, and agreed upon, site acceptance test procedure, performed by the installer.
- F. A valid alarm, from a wearable distress transmitter, anywhere within the defined area of indoor and outdoor coverage shall be reported by the RTLS with a minimum reliability of 99.9%. An alarm shall never fail to be reported because of the presence of nearby concrete walls, metal structures, or other environmental considerations inside or outside of buildings, if such considerations were in place at the time of the installation of the system.
- G. The RTLS shall meet the following system capacity requirements:
 - 1. Minimum of 4,000 unique duress transmitter identification codes.
 - 2. Minimum of 24,000 unique locations, or zones, per facility. Any or all zones may be either indoor or outdoor locations.

2.10

Wearable Duress Transmitter Functionality

- A. The wearable duress transmitter shall include a button that, when pressed, activates an alarm transmission.
- B. Pull-Pin feature:
 - 1. The belt-holster version of the wearable duress transmitter shall be capable of initiating a duress alarm when a pin attached to a lanyard is pulled out.
 - 2. When pull-pin is removed, the device shall transmit repeatedly until the pull-pin is reinstalled.
- C. Man-down feature:
 - 1. The belt-holster version of the wearable duress transmitter shall have an optional man-down capability, whereby the transmitter automatically transmits a duress alarm when it tilts beyond a user-specified angle for a user-selectable period.
 - 2. The device's man-down function shall automatically reset when brought back to its upright position.
 - 3. The man-down function shall include the following user-programmable settings:
 - a. Sensitivity
 - b. Time delay before audible warning
 - c. Duration of audible warning before an alarm is transmitted
- D. Each wearable duress transmitter shall be configurable by the system administrator to report a specific identification code. This will enable any transmitter to be used as a replacement for another transmitter that is damaged or otherwise needs to be replaced.

- E. A user shall be able to test the basic functionality of the personnel duress transmitter without the need for system operator intervention.
- F. The wearable duress transmitter frequency shall be programmable by the system administrator.

2.11 Fixed Position Duress Transmitter Functionality

- A. The fixed position duress transmitter shall include a button that, when pressed, activates an alarm transmission.
- B. Each fixed position duress transmitter shall be configurable by the system administrator to report a specific identification code. This will enable any fixed position transmitter to be used as a replacement for another transmitter that is damaged or otherwise needs to be replaced.
- C. The fixed position duress transmitter frequency shall be programmable by the system administrator
- D. The fixed position duress transmitter's battery shall be replaceable with a standard 9V non-rechargeable battery.

2.12 Alarm Generation and Announcements

- A. Each person requiring the ability to generate a duress alarm shall wear a duress transmitter.
- B. The wearable duress transmitter user shall be capable of transmitting a duress alarm, which will be reported at the control computer, by pressing the button on the wearable duress transmitter.
- C. For versions of the wearable duress transmitter that support pull-pin and/or man-down functionality, a duress alarm shall be generated by:
 - 1. Removing a pull-pin attached to a lanyard from the wearable duress transmitter
 - 2. Activation of the man-down function.
- D. Any area that has a potential for requiring a duress alarm without the presence of a person carrying a wearable duress transmitter shall be equipped with a fixed position duress transmitter mounted on any suitable surface which will be easily accessible by someone under duress.
- E. A duress alarm shall not be reported as originating from more than one location.
- F. The location of a duress alarm transmission shall be visually presented on a computer generated graphic floor plan of all, or part, of the facility. The boundary of the zone in alarm shall be highlighted. Optionally, the alarm point within the zone shall be displayed.
- G. The acknowledgement and clearing of duress alarms, and all other alarm handling functions, shall be performed using a computer mouse or touch screen interface. A computer keyboard shall not be required for the alarm processing operation of the RTLS.

- H. The RTLS shall be able to display alarms from multiple duress transmitters, up to the number of duress transmitters used in the system.
- I. The RTLS shall report duress alarms with a distinct audible and visual indication that is easily distinguished from equipment, maintenance, and diagnostic alarms.
- J. The RTLS shall be capable of communicating duress alarms to other systems in the control room, or in remote locations.

2.13 Reliability and Maintenance Requirements

- A. The RTLS shall continuously monitor the state of all RF receiver hardware. The system shall be capable of reporting a maintenance or diagnostic alarm, upon the detection of a system problem or the failure of a hardware component.
- B. Configuration and upgrades:
 - 1. The RF receivers, transmitters and other hardware items shall be microprocessor based, and shall be designed such that parameter changes and software upgrades can be accomplished without removing the units from the site.
 - 2. The unique ID code and frequency of operation for each duress transmitter shall be configurable.
 - 3. Installed equipment shall be capable of receiving software upgrades from the control computer at the site without the need to physically access each piece of equipment.
- C. Diagnostics and accuracy checks:
 - 1. The system shall run regular diagnostic checks on all installed equipment.
 - 2. The system shall report any exceptions or failures on the control computer.
 - 3. The system shall perform a locating accuracy check along with RF receiver functionality verification a minimum of once per day.
- D. The RTLS shall create and maintain a record of all system equipment failure notifications.
- E. The RTLS software shall not be installed on a Virtual Machine (VM)

2.14 Alarm Recording and Storage

- A. The RTLS shall log all duress and warning alarms to the control computer's hard disk.
- B. Duress alarms shall be displayed as a distinct log, separate from equipment failure and other alarms.
- C. The data logged for each alarm shall include the identification and location of the alarm, the time of the alarm, the time that the alarm condition was acknowledged and the time that the alarm was cleared from the system.
- D. All logged data shall be saved in a commonly accessible data format, from which data can be exported or retrieved by the system administrator, or others, for analysis, printing and/or to archiving.

2.15 Installation and Configuration Capabilities

- A. The RTLS shall be capable of locating duress transmitters within a defined accuracy in all prescribed parts of a facility without requiring the installation of locating hardware in every room, closet, and other discrete location throughout the facility.
- B. In a correctional services environment, the RTLS shall be capable of locating wearable duress transmitters within a defined accuracy, in all prescribed parts of a facility, without requiring the installation of any equipment in the inmate's cells.
- C. The distributed RF receivers shall function correctly when mounted in cable chases, above false ceilings, and in other areas, which are not accessible or visible.
- D. It shall be possible to convert and edit Computer-Aided Design (CAD) files of the facility for use as floor plans in the control computer.

2.16 System Security

- A. The RTLS shall provide a minimum of three levels of password protection. Each level of password protection shall allow successively greater levels of access to operating, maintenance, and administrative functions.

2.17 Networking Capabilities

- A. The RTLS shall support the following receiver interconnect options:
 - 1. Standard off-the-shelf 10/100BaseT Ethernet (RJ-45 connectors)
 - 2. Fiber backbone between buildings

2.18 System Battery Backup

- A. The RF receivers shall be powered by Power-over-Ethernet (PoE) through the Ethernet switches. The Ethernet switches shall use a backup power source by way of a centralized UPS system. Central switch and PC shall also be connected to a UPS.

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.

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.

3.3 System Database Creation

- A. A system data base shall be created based on an accurate and approved set of CAD drawings. This step includes:
 - 1. Import CAD drawings into RTLS software
 - 2. Create floor systems and outdoor zones
 - 3. Placement and naming of rooms

3.4 System Calibration

- A. The installation contractor shall calibrate the system in accordance with the manufacturer's recommended procedures as defined in the manufacturer's documentation.
- B. The installation contractor shall submit to the facility's owner, the configuration settings and performance test report for the system.

3.5 Training

- A. The installation contractor or vendor shall train designated staff members on the system operation and maintenance procedures as described in the manufacturer's product documentation. A record of the training will be documented and submitted to the facility's owner.