Correctional Service Canada
Technical Services Branch
Electronics Systems

ES/SPEC-0405
Revision 2
8 March 2002

ELECTRONICS ENGINEERING SPECIFICATION

FENCE DISTURBANCE DETECTION SYSTEM FOR USE IN FEDERAL CORRECTIONAL INSTITUTIONS

AUTHORITY

This Specification is approved by the Correctional Service of Canada for the procurement and Installation of Fence Disturbance Detection Systems (FDS) in Canadian federal correctional institutions.

Recommended corrections, additions or deletions should be addressed to the Design Authority at the following address: Director, Engineering Services, Correctional Service of Canada, 340 Laurier Avenue West, Ottawa, Ontario, K1A 0P9

Prepared by :	**Approved by :**
Manager, **Electronic Systems Research**	**Director,** **Engineering Services**

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ABBREVIATIONS

The following abbreviations are used in this specification:

ATP	Acceptance Test Procedure
CER	Common Equipment Room
COTS	Commercial-Off-The- Shelf
CSA	Canadian Standards Association
CSC	Correctional Service Canada
DES	Director Engineering Services
EIA	Electronic Industries Association
FDS	Fence Disturbance Detection System
GFE	Government Furnished Equipment
MCCP	Main Communications and Control Post
MDS	Motion Detection System
PDR	Preliminary Design Review
RFP	Request for Proposal
SOW	Statement of Work
STR	Statement of Technical Requirements
TES	Terminal Equipment Space

DEFINITIONS

The following definitions are used in this specification:

Design Authority	Director, Engineering Services (DES) - Correctional Service Canada (CSC) is responsible for all technical aspects of the system design and implementation.
Contract Authority	Public Works and Government Services Canada (PW&GSC) is responsible for all contractual matters associated with the system design and implementation.
Contractor	The company selected as the successful bidder.
Project Officer	A CSC employee or a contracted person designated by DES to be responsible for the implementation of the project.
Off-the-shelf	Equipment currently on the market with available field reliability data, manuals, engineering drawings and parts price list.
Custom Equipment	Equipment designed and/or manufactured specifically for a specific contract.

1.0 INTRODUCTION

1.1 General

This specification defines the essential technical and functional requirements of the Correctional Service Canada (CSC) for the procurement and installation of a Fence Disturbance Detection System (FDS) for federal correctional institutions.

1.2 Purpose

The primary use of the system is to provide an intrusion detection capability at the perimeter fences.

Through the selection of certain options or alternatives, the system described herein would be applicable to new institutions to be constructed. It could also be retrofitted into existing institutions whenever it becomes necessary to add a perimeter motion detection capability or replace existing obsolete equipment.

1.3 Commercial-Off-The-Self Equipment

The FDS shall use commercial off-the-shelf (COTS) equipment and proven designs to the maximum extent possible. New equipment designs shall be restricted to unique interfaces and common control console.

1.4 Technical Acceptability

The Correctional Service Canada (CSC) operational environment is unique for its diversity of locations, climate exposures and the physical restrictive construction techniques of penal institutions. Maintaining national security, the safety of staff and offenders alike is CSC's commitment to the government and public. Electronic security systems operating in this unique environment shall maintain very high standards of dependability and reliability.

The CSC Engineering Services Division has established technical specifications and equipment standards for specific electronic security systems which are based on very specific and restrictive operational performance criteria as detailed in its Electronic Engineering Standard. Technical acceptability of these systems means that the equipment complies with the pertinent CSC specifications and standards.

The technical acceptance process shall involve system and subsystem evaluation in accordance with the applicable CSC specifications in one of CSC facilities. CSC may when it deems necessary, request the supplier to arrange for a full site demonstration. CSC shall verify in depth any of the system technical specifications called up. CSC may rely on manufacturer's test results for specific areas of the specification where an independent test facility has conducted the test, and the facility is deemed acceptable to CSC.

It is the supplier's responsibility to make new developments in products available to CSC for evaluation. Equipment qualification is an ongoing process and can be initiated at any time by a supplier. Any supplier can have access to the CSC specifications and standards. Any new development or products should be submitted to the CSC Engineering Services Division, Technical Authority in a suitable time frame prior to any tendering process to allow for an acceptable evaluation period. The evaluation period may take up to sixteen (16) months.

1.5 Equipment Procurement

Any ordering of equipment/material before the approval of the FDS design report will be undertaken at the contractor's own risk. The Design Authority may authorize the procurement of certain long lead items at, or shortly after a preliminary design review of the proposed system.

1.6 Quantity of Equipment

The quantity and location of the FDS equipment required for CSC institutions are specified in the Statement of Technical Requirements (STR).

2.0 APPLICABLE DOCUMENTS

The following documents of the issue in effect on the date of the Request for Proposal (RFP) shall form a part of this specification to the extent specified herein.

ES/SOW-0101	Statement of Work for Electronic Systems for Correctional Service of Canada Institutions
ES/SOW-0102	Statement of Work for Quality Control for installation of Electronic Systems in Federal Correctional Institutions
ES/SPEC-0005	Specification for Electronic Systems Integration into the Main Communications and Control Post in Federal Correctional Institutions
ES/SPEC-0400	Specification for Perimeter Intrusion Detection Systems
ES/STD-0401	Standard for Fence Sensors
ES/STD-0404	Standard for Proximity Sensors
ES/STD-0803	Standard for Video Display Units
EIA-310-C	Electronic Industry Association Standard for Racks, Panels and Associated Equipment

3.0 REQUIREMENTS

3.1 General

The contractor shall design, supply, install, test and provide documentation and training for an FDS in accordance with the Standards, Specifications and Statements of Work specified in Section 2.0.

3.1.1 System Capacity

The number of perimeter sectors or zones shall be as specified in the STR. The system shall be of a modular design and it shall be possible at a future date to add more sectors or zones and associated processing and control equipment to the basic installed complement without replacing existing hardware.

3.1.2 Period of Operation

The FDS and all associated equipment shall be rated for and capable of 24 hours per day, seven days per week operation. Components of the system located outdoors shall be designed to operate continuously over the range of temperature, wind, precipitation and humidity conditions expected on the site and as noted in this specification.

3.2 System Requirements

3.2.1 Wires, Cables, Conduits, Ducts

The contractor shall supply all necessary terminations, cross connection cabinets, conduits, wire and cabling and any other items that may be required for the satisfactory completion of the specified system. All installation workmanship shall be performed in accordance with ES/SOW-0102, Statement of Work and all applicable national, provincial, and local electrical codes.

A wiring diagram shall be supplied in the Installation section of the Maintenance Manual to detail where connections terminate and how wires are routed and terminated.

Conduits, cables, ducts, trays, etc. may be either Government Furnished Equipment (GFE) or supplied and installed by the contractor depending on the particular institution.

Connectors provided on the ends of any cable must mate with the corresponding connector on the equipment. Adapters from one type of connector to another are not acceptable.

3.2.2 Control Equipment

The maximum feasible amount of common control equipment (power supplies, logic boards, amplifiers, etc.) shall be located in Terminal Equipment Spaces (TES) and Common Equipment Room (CER) provided for this purpose. It is preferred that only equipment such as lights, switches, actuators, etc. which the operator must access directly should be located in the Control Posts (CP).

3.2.3 Floor Space

The contractor shall state in the Preliminary Design Review (PDR) proposal the requirements for floor space to house the electronic control and processing equipment.

3.2.4 Equipment Racks

The contractor shall provide all necessary racks to mount the control and processing equipment.

3.2.5 Interface to Data Logger

The contractor shall supply and install all necessary wiring and control equipment required to interface the system to the Data Logger described in ES/SPEC-0005, Specification.

3.3 Design Requirements

3.3.1 General

To the maximum practical extent, off-the-shelf equipment should be selected for use in the FDS. New designs should be restricted to common interface areas, control panels and consoles, or unique devices for which an off-the-shelf item does not exist.

A design objective is to minimize the number of wires required between all elements of the system.

A space-diversity approach to system planning shall be employed to ensure that loss of one interconnection routing does not impair the operational capability of the complete FDS.

3.3.2 Wiring Supervision

Wiring shall be supervised in all system modes. An alarm shall occur if any system wiring is cut or shorted to other wires or if the system devices are tampered with by unauthorized people or environmental conditions.

3.3.3 Sabotage, Tampering and Survivability

Elements of the FDS shall have high resistance to damage and destruction. All interconnecting service must be secure against tampering or improper interference.

3.3.4 Power/Data Redundancy

The FDS shall be powered from two independent DC power supplies connected to the system at two distinct points. Failure of a single supply shall not cause the system to fail, i.e. either power supply can power the entire system.

The FDS shall communicate with the system controller at two distinct points. Failure of one data line will not cause the system to fail, i.e. the communications shall be fully redundant.

3.3.5 **Power Failure**

Loss or restoration of primary power to the FDS shall not produce spurious alarms or outputs to the data logger. When power is returned after a power failure, the system shall resume normal operation without operator action.

3.3.6 **System Failure**

A system failure shall be deemed to have occurred when any required motion detection is not produced or when any required control function cannot be performed.

3.3.7 **Human Factors**

Elements of the system which are used directly by staff (i.e., control panels, etc.) shall conform with accepted principles of good human factors design.

3.3.8 **Existing Equipment**

In most installations, control elements of the system will share console space with other electrical/electronic detection equipment and will be operated by the same staff member. In such cases it is important that effort be made to coordinate the functional and operational design of the system according to accepted human engineering principles to ensure a uniform appearance and commonality of a layout to assist the operator in the performance of his duties.

3.3.9 **Control Panels**

Mounting space within control posts is usually limited and the problem of determining a suitable equipment mounting location is minimized if the control panels are small. Therefore, the designer should make maximum possible use of control devices which combine two or more functions into a single unit (e.g., a lighted push-button instead of a separate light and an unlit push-button).

The system may use EIA standard display and control panels or video display units. The design of either display and control method shall be in accordance with ES/STD-0802 or ES/STD-0803, Standards.

3.3.10 **Back-Up Power**

The contractor shall identify any built-in or optional power failure protection available with the equipment.

3.3.11 Perimeter Signal & Power Cables

Signal distribution cables for the FDS shall be mounted at the top of the inner perimeter fence. All cable runs from the top of the fence to sensors, pull boxes, etc. shall be carried in a steel conduit and buried where it leaves the fence. All cable runs from the perimeter to the equipment room and/or MCCP shall be carried in buried conduits. All conduits are to be rigid; rigid steel above ground, rigid PVC below ground.

If power is required on the perimeter for the FDS, the power cables shall be buried or run in rigid steel conduct along the outer perimeter fence.

All cables run from the perimeter to the common equipment room and/or Main Communication & Control Post (MCCP) shall be carried in buried conduits.

3.3.12 Sector Calibration Requirements

The FDS shall provide the capability to adjust the sensitivity thresholds remotely by sector. The contractor shall state the following requirements in the technical proposal:

a. number of personnel to complete the adjustments;

b. special calibration equipment (if required); and

c. length of time to adjust each sector's threshold.

3.3.13 Sector Alignment

A preferred sector may be made up of more than one FDS sector, however, the original boundaries must be maintained in order to coordinate with the MDS and CCTV subsystems. A preferred sector layout will be provided in the site specific documentation.

3.3.14 Alarm Display and Control

For each sector of the sensor system, the following functions shall be provided:

a. alarm annunciation (audible and visual);

b. alarm acknowledgement (common);

c. alarm cancellation;

d. sector mask;

e. sector secure;

f. sector test (enable and results displayed);

g. tamper annunciation (not necessarily sector related);

h. tamper acknowledge;

I. tamper cancel;

j. system failure annunciation (not necessarily sector related);

k. system failure acknowledge; and

l. system failure cancel.

A disable control shall be provided for the audible annunciator.

3.3.15 **Test**

The system shall incorporate a TEST capability activated from the remote control panel. The test function will permit the operator to verify correct operation of the complete system from the sensor to the annunciation panel. Any limitations on the test capabilities of the proposed system shall be clearly identified in the proposal.

3.3.16 **System Interface**

The sensor system shall be equipped with an interface providing for the complete status display and system control from a remote display and control panel.

It may not be necessary to provide a display and control panel if the interface requirements can be met via other terminal equipment.

3.3.17 **Interface Specification - Electrical**

The interface between the sensor processor and system controller shall be bidirectional. Each signal shall be available at the interface in either of the following forms:

a. Standard data link message following RS -232C specifications, or

b. Standard data link message following RS-485 specifications.

The interface between the system controller and the PIDS shall be bidirectional. Each Detection, Tamper or Jamming signal shall be available at the interface in one of the three following forms:

a. the equivalent of a dry relay closure for an output and be compatible with a dry relay contact closure for input,

b. Standard data link message following RS -232C specifications, or

c. Standard data link message following RS-485 specifications.

All RS232 or RS485 signals provided to, and received from, the PIDS must conform to either the Senstar-Stellar Sennet or StarCom protocols. Any driver required for another protocol will be the responsibility of the contractor.

3.3.18 **Interface Specification - Physical**

The interface shall be provided in one of two forms as follows:

a. barrier strip; or

b cable connector.

Where a cable connector is used, the contractor shall deliver both male and female components.

3.3.19 **Interface Specification - Functional**

The interface shall permit the remote control and display of the following functions:

a. Alarm annunciation;

b. Alarm acknowledgement;

c. Alarm cancel;

d. Sector mask;

e. Sector secure;

f. Sector test;

g. Sector tamper alarm annunciation;

h. Sector tamper acknowledge;

I. Sector tamper cancel; and

j. System fail annunciation.

Where additional annunciation and control functions are provided, these shall also be available at the interface.

3.4 Operational Requirements

3.4.1 General

The functional requirements of the FDS shall be in accordance with the ES/STD-0401, Standard.

3.4.2 Detection

The installed system shall detect an intruder with a mass of 45 kg or more using any of the following defeat methods employed around the inner perimeter fence.

Any swing or sliding gates forming part of the inner perimeter fence shall be provided permanent, continuous detection coverage.

3.4.2.1 Climbing Technique

The system shall detect any vigorous or careful climb by a climber having a mass of 45 Kg. or more which takes between zero and 7 seconds to get to the top of a minimum 3.60 metre high fence. Time is measured from the first point of contact with the fabric until the time when the top of the fence can be reached. Any attempt to breach the top of the fence must be detected.

3.4.2.2 Cutting Attempts

The system shall detect any cutting attempts using a minimum rate of one cut per 60 seconds.

3.4.2.3 Other Attempts

The system shall detect any valid target employing any method other than cutting which will damage or deform the inner perimeter fence.

3.4.3 Probability of Detection (P_d)

The FDS system shall provide continuous coverage of the specified detection zone using the identified detection criteria, and shall have, as a minimum, a statistical (P_d) as specified in Standard, ES/STD 0401.

3.4.4 Radiated Field / Proximity Detection

For systems which are mounted on the fence structure and which employ radiated field or proximity detection techniques to sense movement, the performance requirements shall be as defined in the Standard ES/STD-0404.

3.4.5 Dead Zones

Any point on the fence structure where reduced or non-detection can be repeated in two concurrent attempts shall be identified as a dead zone.

Any dead zone found in the system coverage during the 12-month period following system commissioning shall be corrected at the contractor's expense.

3.4.6 Nuisance Alarms

Nuisance Alarms are defined as those alarms which occur as a result of the detection of non-valid target within the specified environmental conditions. Nuisance Alarms may be caused by:

a. changes in atmospheric conditions;

b. Small animals (less than 45 kg);

c. Ground/air vibration;

d. Other observable causes (other than valid targets);

e. electrical or radio frequency interference;

f. Personnel, structures, or vehicles outside the detection zone; and

g. Alarms due to unknown causes but which cannot be classified as false alarms

Alarms caused by "Tests" are not classified as nuisance alarms.

Within the specified environmental conditions, the system's nuisance alarm rate shall not exceed:

a. 10 per 24 hour period;

b. monthly average of 0.60 alarms per day per sector; and

c. 7 alarms per sector in any one day.

The contractor shall state the expected nuisance alarm rate for this installation. This stated rate shall form part of any resulting contract. Persistent nuisance alarm rates in excess of the stated number during the 12-month period following commissioning shall necessitate corrective action by the contractor at his expense.

3.4.7 False Alarms

False Alarms are defined as those alarms which are caused by phenomena internal to the sensor. Such phenomena may include intermittent faults and transients due to changes in status of incoming power or may be related to the sensor's signal processing. The False Alarm Rate shall not exceed one per sector per year for the entire system.

3.4.8 **Tamper/Fault Alarm**

The sensor system shall be self-monitoring for short and open circuits, and shall generate an appropriate visual and audible sector alarm signal at the control panel whenever a transducer or associated interconnect circuit is shorted, cut, disconnected, or loss system power.

3.4.9 **Masking**

Each sector of the sensor system shall be capable of having its alarm indications rendered inoperative (masked) by a signal from the control panel, in order to permit maintenance or authorized traffic through the perimeter fence.

3.4.10 **System Test**

It must be possible to remotely test the operational status of the sensor system from the control panel by manually placing a sector or group of sectors in a "test" mode.

3.4.11 **Fail-Safe**

A power failure within the sensor, malfunction of processing or related circuitry, a short or open of any sensor cable or signal cable shall result in an output to the display and control system.

3.4.12 **Sector Audio**

The FDS must be able of providing an audio signal on a sector basis for testing and other maintenance purposes. A speaker and volume control shall also be included in the terminal equipment.

3.4.13 **Perimeter Sectors**

In order to provide prompt identification of the location of an attempted intrusion, the perimeter shall be divided into multiple sectors. The overall number and layout of sectors shall be arrived at by design review, subject to approval by the Design Authority.

3.4.14 **Sector Numbering**

FDS sectors shall be numbered sequentially from one (1) to the sector total, beginning beside the main gate of the institution, and continuing in sequence clockwise around the perimeter.

3.5 **Environmental Requirements**

The FDS shall operate over the environmental conditions in accordance with the ES/STD-0401, Standard.

3.6 Power Requirements

The FDS shall use VAC power within the limits in accordance with the ES/STD-0401, Standard.

3.7 Installation Requirements

The system shall be installed at the site in accordance with the ES/SOW-0101, Statement of Work and the ES/SOW-0102, Statement of Work.

Depending on the configuration of the site or the sensor, the following installation methods shall be considered acceptable for the detection devices:

a. mounted directly on the inner perimeter fence;

b. mounted on a separate structure to be supplied by the contractor and installed on the existing fence; and

c. mounted on a freestanding structure, supplied by the contractor, which may or may not form a separate physical barrier in itself.

The sensor shall not reduce the effectiveness of existing perimeter facilities in deterring, impeding, detecting, or observing escape attempts.

Cables, pull boxes, distribution panels and all exposed equipment shall be secured against tamper and inmate attack. Steel enclosures shall be used throughout the installation; either locked or secured with a maximum of two (2) screws.

Cables, pull boxes, distribution panels and all exposed equipment shall be protected from damage due to lightning.

3.8 Documentation Requirements

All final system documentation shall be provided in accordance with the ES/SOW-0101, Statement of Work.

3.9 Support Requirements

The FDS maintenance and spares support shall be provided in accordance with the ES/SOW-0101, Statement of Work.

3.10 Training Requirements

Operator training and maintenance training on the system shall be in accordance with the ES/SOW-0101, Statement of Work.

4.0 QUALITY ASSURANCE

4.1 General

The system Quality Assurance programme shall be provided as detailed in the ES/SOW-0101, Statement of Work.

All on-site installation work, test plans and system acceptance testing shall be conducted in accordance with the ES/SOW-0101, Statement of Work.

4.2 System Check Out

The FDS contractor shall provide, as a minimum, the following System Check Out Test results to the Design Authority prior to the scheduling of the on-site acceptance tests:

a. Sensitivity profile of each FDS sector, illustrating the sensor's normal status vs. the system's detection threshold level over a 24 hour period.

b. Climbs and simulated cutting attempts at two locations per fence panel around the entire perimeter.

c. Simulated wind test (for at least 30 seconds) for each FDS sector.

4.3 Acceptance Test Procedures

Based on a review of the System Check Out test results, the Design Authority will determine the appropriate number of locations to perform the official climb, cutting, and wind tests.

Special climbs may be attempted at Gate posts, mitred corners, and smaller-than-average fence panels to ensure 100% detection along the inner perimeter.

All climbs, cutting and wind tests must be successful before this section of the ATP is approved.

If any FDS sector requires the physical addition or relocation of sensor equipment or the adjustment of detection thresholds due to failed on-site tests, the System Check Out tests must be repeated for the failed sector(s).

5.0 DELIVERY

Delivery requirements for the system documents, drawings, plans, manuals, etc. (where applicable) shall be in accordance with the ES/SOW-0101, Statement of Work.

Delivery requirements of the system equipment shall be in accordance with the ES/SOW-0102, Statement of Work.

6.0 INTERFERENCE

Performance of the system shall not be affected by the use of standard electronic equipment used at the institution. Distance limits of standard electronic equipment shall be in accordance with ES/SOW-0101, Statement of Work.

7.0 SAFETY

All system electrically powered elements shall meet the applicable Canadian Safety Association (CSA) standards.