APPENDIX A

ELECTRICAL SYSTEMS WORKS

ES-SOW-0101R3E – Procurement and Installation
ES-SOW-0102R6E – Quality Control
ES-SOW-0110R1E – Structured Cable Systems
ES-SOW-0502R2E – Test and Evaluation Guidelines
ES-SOW-0006R2E – Conduit Space and Power

Correctional Service Canada
Technical Services Branch
Electronics Systems

ES/SOW-0101
Revision 3
15 April 2004

ELECTRONICS ENGINEERING STATEMENT OF WORK

PROCUREMENT & INSTALLATION OF ELECTRONIC SECURITY SYSTEMS

AUTHORITY

This Statement of Work is approved by Correctional Service Canada for the procurement and installation of all telecommunications and electronic security systems, subsystems, and equipment in Canadian penal 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:

Manager,
Electronics Systems Research

Approved by:

Director,
Engineering Services

15 Apr 04

RECORD OF REVISIONS

Revision	Paragraph	Comment
3	10.1 – Manuals and Drawings	Added equipment operating software
	10.4 – Documentation Format	Added equipment operating software

TABLE OF CONTENTS

ABBREVIATIONS

The following abbreviations are used in this specification:

ATP	Acceptance Test Plan
CM	Corrective Maintenance
COTS	Commercial-Off-The-Shelf
CSC	Correctional Service Canada
DA	Design Authority
DCR	Design Change Request
DES	Director, Engineering Services
DL	Deficiency List
FDR	Final Design Report
MRT	Mean Response Time
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PDR	Preliminary Design Report
PM	Preventative Maintenance
PW&GSC	Public Works & Government Services Canada
QA	Quality Assurance
RFP	Request For Proposal
SOW	Statement of Work
STR	Statement of Technical Requirement

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

This Statement of Work (SOW) defines the work and responsibilities for the design, procurement, installation, test and integration of all telecommunications and electronic security equipment in CSC Institutions.

The SOW provides guidelines, procedures and responsibilities to the contractor and/or the project officer for the implementation of all telecommunications and electronic security systems in CSC facilities.

All work performed shall adhere to this SOW, CSC Specifications, Standards and Statement of Technical Requirements (STRs).

1.1 Commercial-Off-The-Shelf Equipment

The contractor shall use commercial off-the-shelf (COTS) equipment and proven designs to the maximum extent possible. All new equipment shall meet the specified lifespan requirements. New equipment designs shall be restricted to unique interfaces and common control console.

1.2 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 or may be tested in a CSC facility to verify the effectiveness of the proposed technologies when subjected to the restrictive operational environment.

CSC shall also verify in depth any of the system technical specifications called up. CSC may when it deems necessary, request the supplier to arrange for a full site demonstration. 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 vendor. Any vendor 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.

1.3 Equipment Procurement

Any ordering of equipment/material before the approval of the final 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 the preliminary design review.

1.4 Quantity of Equipment

The quantity and location of the equipment required for CSC institutions will be contained in the specification identified in the STR.

2.0 APPLICABLE DOCUMENTS

CSC Specifications, Standards and STRs are approved by the Director of Engineering Services (DES) for the procurement and installation of all telecommunications and electronic security systems in all CSC facilities. These documents promulgate DES policy and shall not be modified or changed without prior consultation and approval of the Director. The documents of the issue in effect will form part of the Request for Proposal (RFP) issued by the contract authority.

3.0 REQUIREMENTS

3.1 The contractor shall:

a. Design, procure or manufacture, install, test and document the installation of all electronic security and telecommunications systems in accordance with the CSC specifications, standards and STR;

b. Provide the operator and maintenance training in accordance with the CSC requirements;

c. Provide the maintenance support and spares in accordance with the CSC maintenance requirements;

d. Provide quality assurance (QA) to ensure equipment performance and reliability are in accordance to CSC requirements;

e. Provide warranty coverage to include spare parts provision and equipment repair;

f. Provide a program schedule to show all major elements from a contact award to completion of the warranty period and shall include anticipated time of occurrence, interrelationships between events, and time scale; and

g. Be responsible for the integration of the proposed system to any existing telecommunications and electronic security systems.

h. Provide a lightning protection system for the installation of all electronic security systems/equipment in the CSC facilities. As a minimum, surge suppression type lightning arrestors shall be required for all power, communications and antenna cables/wires entering or leaving a building.

4.0 SYSTEM DEVELOPMENT

The contractor shall design systems and equipment to meet all of the requirements stipulated in the applicable CSC specifications. The system design shall be modular and address the following criteria:

a. ease of operation and maintenance;

b. optimize and concentrate control functions and capabilities;

c. enhance the security of the working environment, extend staff capabilities to observe and control; and

d. minimize the number and types of display and control devices.

4.1 Preliminary Design

The preliminary design baseline shall be established by the review and approval of the preliminary design report (PDR) by the Design Authority (DA) or his designate. Specifications, drawings and the approved PDR shall make up the preliminary design baseline.

The contractor shall prepare and submit two (2) copies of the PDR to the Design Authority and one (1) copy to the Contract Authority at least ten (10) days prior to the PDR meeting. The PDR shall consist of:

a. performance specifications with functional block diagrams of the proposed system. The technical analysis and equipment performance data shall verify system requirements;

b. preliminary equipment layouts including control consoles and racks;

c. list of off-the-shelf equipment with part number, model number, manufacturer and the quantity of each item;

d. list of custom designed equipment with model number and the quantity of each item;

e. functional schematics for all custom designed equipment;

f. conceptual drawings for all custom designed equipment;

g. a proposed product assurance plan;

h. a proposed maintenance plan;

l. proposed sparing plan; and

j. proposed training plan.

4.2 **Preliminary Design Review**

The PDR meeting shall be convened by the contractor to review the PDR contents. The contractor shall provide the venue and all of the necessary facilities. The Design Authority will identify any portions of the PDR that are not acceptable to CSC.

4.3 **Final Design**

The final design baseline shall be established by the review and approval of the Design Authority of the final design report (FDR). It establishes the start of change control in equipment design and performance. The FDR shall consist of:

a. all elements of the preliminary design baseline;

b. control console mockups, ergonomics considerations, etc., as necessary;

c. drawings and operational descriptions for the custom designed equipment including interface specifications;

d. Installation drawings and instructions; and

e. availability model and analysis updates to reflect the final system design and hardware selection.

The FDR shall be prepared to good commercial practice. Two (2) copies shall be submitted to the Design Authority at least ten (10) working days before the FDR meeting.

4.4 **Final Design Review**

The final design review meeting shall be convened to review the contents of the FDR. The contractor shall provide the venue and all of the necessary facilities. All of the contractor's staff responsible for the system/equipment engineering shall be available.

4.5 **Design Change Control**

Design changes shall be in accordance with the following procedure:

4.5.1 **Type I.** Changes that affect cost, schedule, reliability, maintainability, or availability shall be submitted as a design change request (DCR).

Changes shall not be actioned until specifically directed in writing by the Design Authority through the Contract Authority.

4.5.2 **Type II.** Changes to correct a design error without affecting cost, schedule, reliability, maintainability, or availability shall not require a DCR.

Changes shall be reported to the Design Authority and the final design baseline shall be updated by the contractor. The Design Authority will review and acknowledge the change.

4.6 Design Change Request (DCR)

Type I changes shall be forwarded to the Design Authority through the Contract Authority on DCRs initiated by either the contractor or the Design Authority.

DCRs shall be reviewed and approved before implementation and shall include:

a. specification requirement being effected;

b. final design baseline element being changed;

c. description of the design change;

d. reason for the change;

e. impact on cost, schedule, reliability, maintainability and availability; and

f. trade-off recommendations.

4.7 In-Plant Testing

Details of in-plant tests are contained in the ES/SOW-0102, Statement of Work. In-plant tests shall be performed according to the Design Authority approved procedures.

Equipment with deficiencies as the result of the in-plant tests shall be subject to retest. The Design Authority reserves the right to add or modify tests.

5.0 SYSTEM INSTALLATION

The contractor shall be responsible for ensuring that sufficient site utilities are available. No work will be permitted at the site before the approval of the Design Authority. All installation activities shall be conducted in accordance with ES/SOW-0102, Statement of Work.

5.1 Schedule

The contractor shall provide a detailed work schedule for the installation activities. This schedule shall reflect the complete implementation plan by identifying the nature of the work to be performed and the area affected.

5.2 On-Site Inspections

Design Authority or an appointed CSC representative shall perform ongoing inspections of the contractor's activities. These inspections shall verify compliance with the project requirements, the quality of work performed and assess the contractor's progress in relation to the approved schedule. Installation deficiencies requiring corrective action will be brought immediately to the contractor's attention in writing.

5.3 On-Site Coordination

Design Authority shall be responsible for the appointment of an on-site CSC representative. This representative will handle all site related manners and will periodically inspect the installation.

When electronic system installations are part of a construction program or a major redevelopment that involves Public Works & Government Services of Canada, the electronic system installation contractor shall coordinate all activities with the relevant site manager and shall comply with this SOW.

5.4 Facility Criteria

The contractor shall provide the facility criteria data in the proposal. Details as to the power, cooling, space and/or other requirements relating to electronic security system installation at the site must be provided. Final facility criteria information must be provided as part of the FDR.

5.5 Installation Design

The system installation design and planning shall make maximum use of existing ducts, conduits, and other cable routing facilities. Where this is not possible, the contractor shall design and install facilities in a manner acceptable to the Design Authority.

5.6 **Subcontractor Supervision**

The contractor shall provide an on-site supervision of all subcontractors. The subcontractors shall abide by the regulations of this Statement of Work and the conditions in the contract.

5.7 **System Checkout**

Before conducting the formal on-site testing for the CSC acceptance, the contractor shall conduct and document a system checkout to assure the system readiness for formal testing and on-line operations. The test sheets used for the system checkout shall be signed by a company representative and provided to the Design Authority at least seven (7) days prior to the scheduled date of the Acceptance testing. The Design Authority will verify readiness through review of the checkout report. The report may be used as reference during the formal witnessed testing for acceptance.

5.8 **As-Built Drawings**

Thirty (30) days after the system installation acceptance, the contractor shall deliver a complete set of equipment and installation as-built drawings for Design Authority's review and approval. Within thirty (30) days after CSC approval, two (2) complete sets of revised drawings shall be delivered to the Design Authority.

The contractor shall update these drawings throughout the warranty period by the design control procedures. Within thirty (30) days of completion of the warranty period, the contractor shall deliver one (1) set of final revised drawings reflecting all changes to the Design Authority. Upon final CSC approval, the contractor shall deliver two (2) sets of original prints of the final drawings.

6.0 SYSTEM ACCEPTANCE

System acceptance shall occur when the acceptance testing has been completed according to the ES/SOW-0102, Statement of Work and when all of the other requirements of the contract have been completed to the satisfaction of the Design Authority. A final acceptance certificate signed by the Design Authority shall certify the system acceptance.

On-site system acceptance testing shall not begin until all of the on-site iInstallation activities have been completed.

6.1 Acceptance Test Plans (ATPs)

The contractor shall provide ATPs for all system, subsystem and equipment tests for Design Authority review and approval. The requirements for the ATP are detailed in the ES/SOW-0102, Statement of Work.

6.2 System Testing

The contractor shall conduct the approved ATP and record the results. The Design Authority or an appointed CSC representative shall witness the tests.

6.3 Deficiency Lists (DL)

The contractor shall prepare and submit a list of deficiencies divided into three categories:

a. Visual/Mechanical,

b. Operational, and

c. Technical/Functional.

6.4 Technical Acceptance

Upon verifying that all of the deficiencies have been corrected, the Design Authority shall issue a letter of Technical Acceptance.

7.0 QUALITY ASSURANCE (QA)

The QA program shall include quality control and system tests/verification programs to verify that new design and off-the-shelf equipment requirements have been met. System tests/verification will be conducted by the contractor in-plant and on-site, and may be witnessed by the CSC representatives where appropriate. The system shall pass all tests before approval will be given to commence the operator and maintenance training programs and warranty period.

7.1 Quality Control Program

The contractor shall provide a description of their internal quality control programs for CSC review and approval. CSC reserves the right to audit and verify that all materials destined for use in CSC systems have been thoroughly inspected and that QA procedures are applied during production and testing.

7.2 System Test Program

The contractor shall prepare and provide the documents describing: number, type and details of equipment, subsystem and system tests for CSC review and approval. These documents must be approved before any formal testing and will consist of the following:

7.2.1 System Test Plan.

This plan shall contain the test philosophy, the tests to be conducted, the pass-fail criteria, the retest requirements, and the instructions for the validation and the sign-off of all final design baseline requirements.

Before witnessing these tests, the CSC representative will perform a visual and mechanical inspection to ensure that the system installation meets the requirements of ES/SOW-0102, Statement of Work.

7.2.2 Test Procedures. These procedures shall ensure that:

a. all equipment supplied meets the performance specification;

b. each subsystem meets the applicable performance requirements; and

c. the overall system meets the performance requirements.

d. test procedure contains the step sequence for each test to be conducted, and the expected results.

7.2.3 **Contractor Testing.**

All tests are conducted by the contractor and may be witnessed by an appointed CSC representative. Tests are conducted as stipulated in the approved plan and procedures. The contractor shall inform CSC at least five (5) working days before the test start date.

7.2.4 **Test Reports.**

The contractor shall submit final copies of the test results for CSC review and approval within ten (10) working days of the completion of the testing. Two copies of the report shall be submitted and shall include:

a. a summary description of the tests;

b. test results consisting of completed test procedures verified by a CSC representative;

c. incident reports, including analysis and corrective action; and

d. results of any retest.

8.0 TRAINING

The contractor shall develop, document and conduct training for both the operational and the technical staff. The training shall be conducted on-site at the institution in the period designated by the schedule.

8.1 Classroom Training

Classroom lectures and demonstrations will be conducted on-site to train operations staff in the use and technical personnel in the maintenance of the systems.

8.2 Training Documentation

The contractor shall develop and deliver a complete training plan to the Design Authority for comments and approval. This plan must be submitted to CSC at least thirty (30) days in advance of the training date to allow for CSC review. As a minimum, the training material shall contain:

a. training plans for CSC operations trainers and technical personnel;

b. manuals for each student to add notes;

c. training aids; and

d. student materials.

Training material shall be provided in the language that is dominant at the site (French in Quebec). Sufficient copies of all student materials shall be provided by the contractor at the beginning of the training course to assure one copy for each student. CSC shall stipulate the number of staffs who are to be trained. Upon approval by the Design Authority, two (2) copies of all material shall be delivered to CSC.

9.0 MAINTENANCE and SPARES

The contractor shall provide maintenance and spares support plans according to the ES/SOW-0102, Statement of Work for the Design Authority approval. These plans shall be submitted according to the schedule.

9.1 Maintenance Plan

The maintenance plan shall describe the philosophy, the Preventive Maintenance (PM) procedures and schedules, the Corrective Maintenance (CM) methods and response times, Mean-Time-To-Repair (MTTR) for all systems. The plan shall recommend tools, jigs and test equipment, and detail the recommended manning method for the system. Issue of the final maintenance support plan will be contingent on Design Authority approval.

9.2 Spares Plan

The spares plan shall list the required spares and recommended quantities. The quantity recommendations shall be supported by system availability and reliability analysis and available experience data. The bidder shall identify spare parts and components by their original manufacturer's code, cross-referenced to the equipment vendor's part number.

9.3 Spares List

The spares list shall identify the following:

a. the spare parts and the subassemblies with the recommended quantities;

b. the cross-reference listings between the vendors and the original manufacturer's codes;

c. the unit and extended prices for stocking; and

d. the expected life or the annual consumption of each part.

The contractor shall maintain the spares plan through to the end of the warranty period, and shall ensure that any changes because of approved design changes are incorporated in the spares list.

9.4 Test Equipment

The contractor shall provide a list of test equipment required for the on-site maintenance of the system within thirty (30) days from Design Authority's acceptance of the final design.

10.0 DOCUMENTATION

All final documentation in hard-copy format shall be in a 3-ring binder with all foldout pages having reinforced ring holes.

10.1 Manuals and Drawings

The following items make up the final documentation requirements:

a. Operator Manual,

b. Maintenance Manual,

c. Installation As-built Drawings,

d. Equipment As-built Drawings, and

e. Equipment Operating Software.

The contractor shall prepare and submit all manuals and drawings to the Design Authority for review and approval. The manuals and drawings will be approved when all changes have been satisfactorily incorporated. All drawings must be produced with AUTOCAD (latest available version)

10.2 List of Equipment

The contractor shall provide a list of equipment itemizing the location, quantity, model number, serial number and revision level of all installed equipment.

10.3 Baseline Measurements

The contractor shall provide a copy of the final test results. These results will be used as a reference baseline measurement for monitoring system degradation over time.

10.4 Documentation Format

All manuals, documentation including as-built drawings, lists of equipment and baseline measurements shall be submitted as per the following schedule:

- One (1) hard-copy version of all documentation.

- One (1) electronic version of all documentation in a ‘read-only’ format on a 3½ inch diskette medium; suitable for duplication without any special requirements.

- One (1) electronic version of all documentation in a full 'read-write' format to serve as a master of the documents and drawings.

- all software requirements to access the electronic versions of the documentation.

- One (1) CD containing the equipment operating software.

10.5 **Operator Manuals**

The contractor shall provide CSC approved manuals to support the operation of the system in the format as outlined in section 10.4 of this specification. These manuals shall be prepared to the best commercial standards. Photo copies shall not be accepted. All hard-copy versions shall be on paper stock 8 ½" x 11" and shall be presented in a 3-ring binder. The manuals shall comply with the following format and content requirements:

a. title page;

b. revision notice page, lined, with columns for revision numbers, dates and initials;

c. table of contents;

d. warnings and cautions;

e. introduction - general information including a description of equipment or system and summary of capabilities;

f. theory of operation including an explanation of all major system components;

g. detailed description and use of all user accessible computer screens; and

h. block diagrams.

A hard copy draft version of the manual(s) shall be submitted for CSC approval on or before the date given in the schedule. Upon acceptance and approval by the Design Authority, a total of two copies shall be provided for use during the warranty period. The contractor shall update these manuals through the warranty period and provide revision bulletins to record manufacturers' recommended modifications, etc. during the life of the equipment.

Within thirty (30) days of the warranty expiry date the contractor shall submit one (1) set of final, updated manuals for CSC approval. Following the final CSC approval, the required number of sets of operator manuals shall be delivered to the Design Authority in the format as specified in section 10.4 of this Statement of Work.

10.6 **Maintenance Manuals**

The contractor shall provide CSC approved manuals to support the maintenance of the system in the format as outlined in section 10.4 of this specification. These manuals shall be prepared to the best commercial standards. Photo copies shall not be accepted. All hard-copy versions shall be on paper stock 8 ½" x 11" and shall be presented in a 3-ring binder. The manuals shall comply with the following format and content requirements:

a. title page;

b. warranty page - explaining the warranty period and expiry dates;

c. revision notice page, lined, with columns for revision numbers, dates and initials;

d. table of contents;

e. introduction - general information including a full description of equipment or system, technical summary, specifications and detailed block diagrams;

f. theory of operation including a detailed explanation of all circuits and parts;

g. alignment and test procedures;

h. repair procedures including step by step fault finding or fault localizing;

I. block diagrams;

j. circuit schematics (clear, easy to read, foldout type);

k. complete parts list;

l. mechanical drawings, chassis layout illustrations and wiring data lists; and

m. drawings including as-built and as-installed drawings.

A hard copy draft version of the manual(s) shall be submitted for CSC approval on or before the date given in the schedule. Upon acceptance and approval by the Design Authority, a total of two copies shall be provided for use during the warranty period. The contractor shall update these manuals through the warranty period and provide revision bulletins to record manufacturers' recommended modifications, etc. during the life of the equipment.

Within thirty (30) days of the warranty expiry date the contractor shall submit one (1) set of final, updated manuals for CSC approval. Following the final CSC approval, the required number of sets of maintenance manuals shall be delivered to the Design Authority in the format as specified in section 10.4 of this Statement of Work.

11.0 PROJECT PROVISIONS

11.1 Monthly Progress Reports

The contractor shall submit monthly progress reports. These reports shall report the activities for the previous period. One (1) copy shall be delivered to the Design Authority and one (1) copy to the Contract Authority by the fifth (5th) day of each month. A review meeting may be required.

Monthly reports shall contain the following:

a. summary of the month's activities;

b. scheduled shortfalls and rescheduled dates;

c. problem areas and proposed solutions;

d. review of next month's activities;

e. summary of meetings held during the month; and

f. cash flow forecast.

11.2 Monthly Review Meetings

Review meetings shall be held at the contractor's premises, Design Authority's office, Contract Authority's office, or the site depending on the need. The contractor shall make the design staff members available upon request by the Design Authority.

11.3 Maintenance Support

During the training period, the contractor shall provide maintenance support. This support is expected to be not less than on-site coverage during the normal working day.

11.4 **Shipment and Delivery**

Contractor shall be responsible for the shipment and delivery of equipment and materials to the site. Packing, crating, and shipment of equipment shall be to good commercial practice, and any damage to, or loss of equipment shall be repaired or replaced to the satisfaction of CSC. The contractor must properly label all shipments to assure correct identification and disposition on arrival at the site, as specified in ES/SOW-0102, Statement of Work.

12.0 SYSTEM AVAILABILITY

All elements of customed and off-the-shelf equipment shall be designed to operate in a highly reliable fashion, consistent with available technology, with a minimum of system downtime due to scheduled and unscheduled maintenance. System availability will be achieved when each of the included subsystems availabilities have been proved as required.

12.1 Common Facilities

Where units or subsystems are integrated into common facilities no single failure of a component, assembly subassembly, or subsystem shall result in the failure of any other subsystem; nor result in reduced capacity or quality of performance of other subsystems or parts of it.

12.2 Single Point of Failure

The system shall be designed such that no failure of a single component, unit, subassembly or subsystem will result in failure of the next higher hierarchical elements of that subsystem or the system.

12.3 Availability Model

The bidder's technical proposal shall include a complete model and analysis of the availability of each subsystem and of the complete system being offered. This analysis shall include both MTBF and MTTR calculations and shall treat the Mean-Response-Time (MRT) as zero. This availability analysis may be based on either:

a. summation of failure rates of the individual components; or

b. the bidder's documented experience with the same equipment operating in a similar physical environment.

In either case, the source of all failure-rate shall be clearly shown.

The contractor shall maintain the availability model and analysis up-to-date throughout the contract period. A statement of impact of the proposed change would have on the availability model and analysis shall be submitted with all Type I DCRs.

12.4 Availability

Availability is the probability that the system, or subsystem will meet operational performance requirements at all time. Time includes the operating time, the active repair time and the administrative and logistic time. To calculate this availability, the contractor must include all of the pertinent factors such as:

12.4.1 **Mean Time Between Failure (MTBF)**.

The total operating time of the equipment divided by the total number of failures of that equipment.

12.4.2 **Mean Time To Repair (MTTR).**

The repair time divided by the number of failures.

12.4.3 **Mean Response Time (MRT).**

The time to respond to a call for service divided by the number of calls.

12.5 **Expected Life Duration**

This is the time during which the equipment is expected to provide useful service, without an unusual amount of service and without becoming obsolete.

13.0 INTERFERENCE

13.1 Interference to the System

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 are as follows:

13.1.1 CB transceivers at 1 metre or more;

13.1.2 VHF and UHF transceivers at 1 metre or more;

13.1.3 Other radio frequency transmitting, receiving and re-distribution equipment at 5 metres or more; and

13.1.4 Personal computer and/or computer work stations at 5 metres or more.

13.2 Interference by the System

The system shall not interfere with any standard electronic equipment used at the institution, any commercial TV or radio equipment at a minimum distance of 5 metres, or any other electronic security systems at a distance of 1 metre or more.

14.0 LIGHTNING PROTECTION

Surge suppression-type lightning arrestors shall be installed to protect all power, communications and antenna cables or wires entering or leaving a building.

These arrestors must be installed where the cable enters the building i.e. not in the CER or other equipment room.

Correctional Service Canada
Technical Services Branch
Electronics Systems

ES/SOW-0102
Revision 6
1 May, 2008

ELECTRONICS ENGINEERING STATEMENT OF WORK

QUALITY CONTROL FOR PROCUREMENT AND INSTALLATIONS OF ELECTRONIC SECURITY SYSTEMS

AUTHORITY

This Statement of Work is approved by Correctional Service Canada for the procurement and installation of all telecommunications and electronic security systems, subsystems, and equipment in Canadian penal institutions.

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

Prepared by:

Manager,
Electronics Systems Research

Approved by:

Director,
Engineering Services
18 Aug 06

RECORD OF REVISIONS

Revision	Paragraph	Comment
3	5.1 - Design Considerations	Tabletop or wall mount power supplies/transformers
4	3.1.1 - Wiring/Cabling Methods	Wiring/cable access
	3.2.1 - AC Wiring	Power outlet strip
		Separate circuit breakers connected to opposite phases of the AC feed
	3.2.2 - AC Power Connections	Power connections via flexible armoured cable
5	Abbreviations	Additions
	1.4 – Manufactured Equipment	Approval of custom equipment
	1.5 – Commonality of Equipment	Add security screws
	3.1.1 – Wiring and cabling	Single conductor wire only on IDC connectors
		Identification of conductors
	3.1.2 – Cable/Wiring Labelling	Acceptable labelling
	3.2.1 – AC Wiring	Mounting of power strips
	3.3.4 - Labelling	Acceptable labelling of racks, boxes, etc.
	5.1 – Design Considerations	DIN rail power supplies preferred
6	2.1 – Environmental Conditions	Expand airborne containments
	2.6 – Finish Application	Change finish material definition
	2.2.2 - Plastic	Remove last sentence
	3.1.1 – Wiring/Cabling Methods	Change “Hydro Codes” to “Electrical Authority”
	3.3.2 - Enclosures	Add requirement to meet IP64

TABLE OF CONTENTS

ABBREVIATIONS

The following abbreviations are used in this specification:

AC	Alternating Current
ATP	Acceptance Test Procedure
BER	Beyond economical repair (repair cost in excess of 60% of replacement cost)
CER	Common Equipment Room
COTS	Commercial -of-the-Shelf
CSC	Correctional Service Canada
CSA	Canadian Standards Association
DC	Direct Current
DA	Design Authority
DES	Director, Engineering Services
EIA	Electronic Industries Association
EMT	Electrical Metallic Tubing
IDC	Insulation Displacement Connector
ISO	International Standards Organization
PCB	Printed Circuit Board
PVC	Polyvinyl Chloride
QA	Quality Assurance
RFP	Request For Proposal
STR	Statement of Technical Requirements

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 Service Canada (PW&GSC) and/or the Materiel Management Division of CSC is responsible for all contractual matters associated with the system design and implementation.
Project Manager	A CSC employee and/or a contracted person designated by DES to be responsible for the implementation of the project.
Project Officer	A CSC employee and/or a contracted person designated by DES to provide technical and/or engineering services in support of the project.
Contractor	The company selected as the successful bidder.
Off-the-shelf	Equipment which is commercially, complete with field reliability data, manuals, engineering drawings and parts price list.
Custom Equipment	Equipment designed and/or manufactured specifically for a specific contract.

APPLICABLE DOCUMENTS

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

CSA STANDARD C22.1-1986	Canadian Electrical Code - Part 1 Safety Standard for Electrical Installations
EIA STANDARD EIA-310-D	Racks, Panels and Associated Equipment
CSA STANDARD C22.2	Canadian Electrical Code - Part II
EIA RS-406/IPC-C--405A	Connectors, Electric, Printed Wiring Boards

Any other applicable industrial safety and control standards governing specific aspects for equipment and/or installations.

1.0 INTRODUCTION

1.1 General

This document defines the quality control requirements for the design, installation, testing and acceptance of telecommunications and electronic security systems in all Correctional Service Canada (CSC) facilities.

1.2 Scope

This specification has been developed to ensure high standards for the installation of electronic systems. It defines workmanship standards which may not be fully covered in subsidiary specifications. All contractor's documentation and installation procedures shall meet this specification for equipment reliability, maintainability, longevity, appearance and operational use.

1.3 Off-The-Shelf Equipment

The contractor shall provide commercial off-the-shelf (COTS) equipment wherever possible. COTS equipment shall meet or exceed the manufacturing standards as listed in this specification.

1.4 Manufactured Equipment

Where COTS equipment is unavailable or unsuitable for a specific application, the contractor may manufacture or arrange for the manufacturing of a particular item to suit the requirements. Manufactured equipment shall meet or exceed the best commercial equipment manufacturing standards. Approval of the final design, appearance and ergonomics of all custom manufactured equipment shall rest with the DES, Project Manager or CSC delegate.

1.5 Commonality of Equipment

The contractor shall provide commonality of hardware components within the design parameters ie. switch locks, racks, panels, security screws, etc. All equipment, if appropriate shall be interchangeable.

2.0 MATERIAL AND EQUIPMENT REQUIREMENTS

2.1 Environmental Conditions

All materials and equipment which is used in CSC installations shall be equal to, or better than the standards established in the original equipment and shall be chosen with due consideration being given to the intended use, safety, retention of appearance, maintainability and durability under rugged operating conditions. These materials shall be suitable to perform over the following environmental ranges:

a. **Indoor Equipment**

Temperature: 0° C to 40° C; and
Humidity: 20% to 95% non-condensing.

b. **Outdoor Equipment**

Temperature: -40° C to +50° C; and
Humidity: 0 to 100%, condensing.

Outdoor equipment shall operate reliably and not be damaged by combinations of direct exposure to the sun, wind, rain, lightning, hail, snow and ice as may be expected to occur at each institution location.

Complete assemblies of indoor equipment shall be resistant to liquid spills, airborne contaminants (dust, pollen and water droplets), shock and vibration.

2.2 Materials

2.2.1 Metals

Metals used shall be either corrosion resistant or be suitably treated to resist corrosion in all potential atmospheric conditions, including tear gas, to which the installation may be subjected.

For the connection of copper to a cadmium or galvanized surface, effective "wiping" of the copper surface shall be considered satisfactory protection.

No cut galvanized fitting shall be used without protection equal to or greater than the original galvanized surface. All parts shall be free from burrs and sharp edges.

Metal which has been cut, scraped, or drilled shall be properly treated (primed and painted) to retain a uniform appearance.

2.2.2 **Plastic**

Plastic materials must be stable and shall retain their original shape and finish over the range of operating environmental conditions specified in 2.1

No material shall be used that softens or hardens within the storage environment in a way which is detrimental to its suitability as replacement parts for existing equipment.

Metal screws shall not be threaded into plastic materials.

2.2.3 **Natural Rubber**

The use of natural rubber is prohibited.

2.2.4 **Wood**

The use of wood or wood products is not acceptable.

2.3 **Toxic Materials**

Materials capable of producing harmful toxic effects under any operating condition, equipment malfunction, or accidental cause shall not be used.

2.4 **Flammable Materials**

Materials, used either for electrical insulation or mechanical purposes which are combustible or capable of causing an explosion, shall not be used.

2.5 **Fungus and Insect Supporting Materials**

Materials capable of providing a nutrient medium for fungus or insects shall not be used.

2.6 **Finish Application**

Finish shall be applied to all surfaces where consideration of appearance and protection against corrosion, toxicity, and other deterioration exists.

Application of finish shall not impair equipment performance, and will maintain uniformity in outward appearance.

Finish materials must be scratch resistant, not react to normal cleaning products and applied so as to last at least ten years.

3.0 INSTALLATION REQUIREMENTS

3.1 Wiring and Cabling

Prior to the installation, all wires and cables shall be tested in accordance with the manufacturer's instructions and shall meet all performance parameters.

Wire and cable harnesses shall be neatly formed and clamped in position. If brackets, forms or clamps are required, these shall be the responsibility of the contractor.

All wires and cables shall be stranded. Single conductor type wires are not acceptable except when such cables are specified to terminate on an IDC type connector. This does not apply to coaxial cables with single centre conductors.

Electrical tape, masking tape, or its equivalent shall not be used on wires, cables or any installed equipment.

3.1.1 Wiring/Cabling Methods

Three (3) or more individual wires or cables which are located in one(1) cable run shall be formed into a cable harness, properly dressed, supported and securely tied with flat lacing twine or equivalent.

Wires and cables which are installed by the contractor external to consoles, equipment racks, pull boxes and junction boxes shall be contained in securely mounted conduit or cable tray systems.

Plastic PVC conduits may be used in underground installations unless otherwise specified at time of bidder's conference.

A rigid steel conduit shall be used in indoor, security sensitive areas and outdoor above-ground applications.

Signal and 120 VAC power wiring shall not be run in the same conduit, cable tray, or raceway; and shall be separated in accordance with the local Electrical Authority.

Wire splicing in cable runs shall not be permitted. All cable runs shall be continuous. If continuous cable runs are not possible, terminal block configurations are acceptable provided they are approved by the Design Authority.

Cross-connects installed on BIX. or similar blocks, must not pass across the face of the block, but must be carried around the block, so as not to impede access to the connections.

BIX, or similar, blocks are to be used for solid wire only. Stranded wires are not to be directly terminated on BIX, or other IDC terminations.

Wires in multi-conductor cables which terminate on connectors, and which are not being used, must be twisted around the cable in a neat fashion. They are not to be cut off.

Wires in multi-conductor cables which terminate on BIX or similar IDC connector blocks, and which are not being used, must be punched down on the block. They are not to be cut off.

All conductors on IDC and any other type of terminal block will be identified with a cable marker and cross referenced in the as-built drawings.

Rectangular slots shall be cut in the computer floor, underneath any cabinets, racks, and consoles, for the running of cables. These slots must constitute at least 1/2 of the available floor area. Sharp edges on the computer floor shall be supplied with suitable protection to eliminate possible nicks, tears or wear in cable insulation sheaths. Individually drilled holes for the purpose of carrying cables from the under floor to the inside of the cabinet, rack or enclosure are not permitted.

3.1.2 **Cable/Wiring Labelling**

The contractor shall label all cables and cable runs. The labelling method shall be logical and conform to industry standards.

All cables shall be identified with commercially produced or machine printed alpha numeric labels protected by clear heat shrink tubing. Hand printed labels are not acceptable.

All wiring shall be identified at both ends of the wire. The coding shall enable a technician to identify the wire or cable without referring to manual tracing methods, test equipment or as-built drawings.

Cable identification labels shall be attached as follows:

a. within 30 cm of the termination for both ends.

b. in the middle of any access point, i.e. pull box, wall shaft opening, cable tray, etc.

All individual wires shall be labelled according to a cable numbering system or wire function plan, which is acceptable to the Design Authority.

All terminal strips shall be identified with its own unique terminal number and function.

3.1.3 **Exterior Cabling**

Where a cable enters or exits an exterior box, chassis, or conduit, the cable entrance shall be completely sealed to prevent an influx of water. A drip loop shall be formed in the cable to assist in maintaining this weather tight seal.

Conduit bushings shall be used on all conduit entrances/exits.

Sharp edges on metal boxes or chassis enclosures shall be supplied with suitable protection to eliminate possible nicks, tears or wear in cable insulation sheaths.

3.1.4 **Slack**

Wires and cables shall be as short as practical, with sufficient slack to:

a. allow a minimum of three (3) reconnects due to wire breakage;

b. prevent undue stress on cable forms, wires, terminals and connections;

c. enable parts to be removed and replaced during servicing without disconnecting adjoining wires or circuits;

d. facilitate movement of equipment for maintenance purposes; and

e. provide drip loops in exterior cabling.

Slack shall be provided in junction boxes where space permits. Slack shall not exceed one single loop of cable forming the circumference of the junction box.

Slack shall be provided below equipment racks and shall be neatly coiled below the access flooring. The length of slack shall be equal to the height of the associated equipment rack. Units in drawers and slide out racks shall be provided with sufficient slack to permit removing the units without severing connections.

All cross connection wiring shall be neat and tidy, properly bundled, and tied. This procedure shall allow sufficient slack for tracing of individual wires via manual methods.

Parts mounted on a hinged door shall be wired by means of a single cable, and arranged to flex without being damaged by the opening and closing of a door. If physical separation between wires is essential so as to make a single cable impractical, more than one flexible cable may be utilized.

3.1.5 **Terminations**

All terminations relying on friction for electrical and mechanical connection shall be tested in accordance with the manufacturer's instructions and shall meet the performance requirements detailed therein.

Terminal fanning strips shall be used where a number of wires are contained in a harness, shall be used unless a multi-pin connector is provided.

Spade terminal lugs shall be used on all wiring, connections to screw-thread terminals, except where solder or other type of terminal is specified.

Where wires are connected to lugs, which are clamped under screw terminals in the form of a terminal connection strip, no more than one wire shall be attached to each lug, in order that each wire may be removed individually. This requirement will not apply in the case of common connections, daisy chain distribution circuits, or similar terminations where wires will not need to be disconnected for servicing.

No more than two (2) lugs shall be attached to each terminal.

Wire and cable insulation shall be stripped back to allow for proper connection to the lug. No bare wire shall be visible between the terminal lug and the insulator.

Terminal strips must be fastened to a hard surface using a screw, or nut and bolt. Adhesive supports to secure the terminal strip, or floating terminal strips are not acceptable.

3.1.6 **Splicing and Joining**

Splicing of wires on new installations is not permitted.

Where connectors are used on cable assemblies, they shall be a locking type which will not disengage under tension.

All joints or splices in underground cable runs shall be located inside accessible, secure, waterproof, and lockable steel enclosures. The enclosures shall be located at least one (1) metre above grade and be firmly secured to existing structures or to stub pole supports.

Splices in underground cable runs, if required to repair Crown caused damage, shall be subject to approval from the Design Authority.

Stranded conductor splices shall be held by wire binding terminals in order to prevent stray strands from causing either short circuits or grounds.

Joints and splices shall be soldered and encased in waterproof shrink tubing for protection against leaching, oxidization, moisture damage, etc.

Joints and splices shall be clearly and accurately identified on applicable as-built drawings.

3.1.7 **Shielding**

Shielding shall be secured on wires and cables to prevent accidental contacting or shorting exposed current-carrying parts, grounded metal objects, or structures.

Shielding shall terminate at sufficient distance from the exposed conductors of the cable to prevent shorting or arcing between the cable conductor and the shielding.

Ends of the shielding material shall be secured against fraying.

3.1.8 **Protection**

Wires and cables shall be strategically located and protected to avoid contact with rough, irregular surfaces or sharp edges.

Wires and cables shall be protected by suitable grommets or bushings when passing through openings in metal.

Guards or other suitable protection shall be provided on insulated high voltage cables.

3.1.9 **Support**

Wires and cables shall be properly supported with adequate strain relief to prevent excessive strain on the connections, devices, or joints of any electrical apparatus connected therein.

Adhesive supports with ty-wrap products shall not be used unless they are secured by a nut and bolt device.

3.1.10 **Clearance**

Physical clearance between wires/cables and associated heat emitting parts, i.e. amplifiers, shall be sufficient to prevent deterioration of the wires or cables. Refer to Table 19 of CSA Standard C22.1 Part 1.

3.1.11 **Inductive and Capacitive Effects**

Wires and cables, including harness wire and cables, shall be located such that inductive and capacitive effects do not adversely affect system operation. The amount of twists in paired wires shall be increased over the length of wire not covered by the cable sheath.

3.2 **Power Wiring**

The contractor shall not employ "Marette" (TM) type connectors regardless of CSA Standard C22.1 regulations. All wiring shall terminate on an insulated or protected barrier strip or terminal board, and be provided with spade terminal lugs where required.

Where control and signal wires which are run in conduit, cable-harness, or cable-trough systems, shall be run in separate wire ways. The separation shall be a physical barrier of suitable material and shall conform to applicable building codes and wiring methods.

All high voltage and/or high current terminations shall be provided with protective guard devices by the contractor. The device shall be mounted to allow for maintenance access to the terminals.

Terminal lugs shall be used on all power wiring, both VAC and VDC.

Warning labels must be installed in accordance with the CSA guidelines to warn maintenance personnel of any hazardous voltages and currents.

3.2.1 **AC Wiring**

AC wiring methods shall conform to all local and national wiring regulations.

Outlet boxes shall be installed such that all outlets are clear of any obstructions including wiring and cabling, and shall be easily accessible.

Power distribution within a cabinet or rack shall be via a power outlet strip, as provided by the original cabinet or rack manufacturer. A third party outlet strip is not acceptable. All power strips must be mounted into the equipment cabinet with rack mounting hardware.

All power cable installations shall be completed in a neat and sturdy fashion and shall meet all requirements of the specifications detailed herein.

Power cords within equipment cabinets and racks shall be maintained as short as practicable with due consideration for maintenance needs.

Systems which use redundant equipment, such as dual microprocessors, shall power each unit from two separate breakers connected to opposite phases of the AC feed.

3.2.2 **AC Power Connections**

All AC power connections from the cabinet or rack power outlet strip to the AC junction box shall be via flexible armoured cable. AC power connectors are not permitted.

3.3 **Conduits, Enclosures, Cable Troughs and Raceways**

3.3.1 **Conduits**

Conduits installed above ground, and accessible to the inmate population, shall be rigid steel.

Metal conduits installed in secure and inmate accessible areas shall be fitted with double the normal quantity of support hangars.

In locations subject to extreme temperature changes, and/or where conduit lengths are of non-standard size, the contractor shall make provisions for the inclusion of conduit expansion joints.

Rigid PVC conduits shall be used only in buried applications.

Rigid PVC conduits shall not be threaded, but may be used with approved adapters and couplings applied in a manner consistent with industry standards.

EMT conduit may be used in administrative areas, and locations which are not normally assessable to the inmate population.

Liquid-tight flexible metal conduits may be used where a flexible connection is required, i.e. cameras, microwave dishes, etc. In such applications, the length of "flex" conduit shall not exceed one (1) metre.

PVC conduits which cross roadways shall be encased in poured concrete.

The contractor shall provide a suitable means of protecting the buried conduit against damage caused by digging or excavating. The preferred method is installing a tape marker directly above the conduit path.

In addition to these requirements, the applicable industrial standards apply, including:

a. CSA Standard C22.2 No. 45-M1981 - Rigid Metal Conduit

b. CSA Standard C22.2 No. 56-1977 - Flexible Metal Conduit

3.3.2 **Enclosures**

All electrical connections, terminations, and cross connections shall be made within lockable, covered steel enclosures, using good quality locks. At least two keys must be supplied to CSC.

Outdoor enclosures shall be environmentally sealed and gasketed to provide a moisture/dust free and secure environment.

Enclosures which contain electrical equipment such as circuit breakers, relays, switches, and transformers, or cable networks, connections and terminations, shall be weatherproof and dust-tight and meet the provisions of IP64.

All enclosures such as junction boxes, racks and consoles shall be positioned for ease of maintenance, service, and connection/disconnection of cables and cable harnesses.

The contractor shall provide a proper drain hole in all enclosures which are grouted in concrete.

All floor mounted cabinets, racks, and consoles shall be secured to prevent overturning when associated drawers, shelves and movable parts are extended, or when heavy objects are placed on pull out shelves or writing tables.

In addition to the provisions stated herein, the applicable industrial standards shall apply, including:

a. CSA Standard C22.2 No. 29-M1983 for Industrial Products.

b. CSA Standard C22.2 No. 94-1976 for Special Purpose Enclosures.

3.3.3 Cable Troughs and Raceways

Cable troughs and raceways shall be continuous and shall be constructed of metal.

The contractor shall provide adequate mounting devices which will permit the use of fastening devices that will not damage conductor insulation.

Cable troughs, raceways, and fittings shall be free from burrs or other sharp edges which may cause damage to the cable or insulated conductors.

Cable troughs and raceways shall be installed as a complete system before the conductors or cables are installed.

Cable troughs may be either ventilated or solid and unless otherwise specified, shall be equipped with covers and steel guards to protect against damage.

In addition to these provisions, the appropriate standards shall apply, including:

a. CSA Standard C22.2 No. 126-M1980 - Cable Troughs and Fittings.

b. CSA Standard C22.2 No. 79-1978 - Raceways and Fittings.

c. CSA Standard C22.2 No. 62-1972 - Surface Raceways and Fittings.

3.3.4 Labelling

The contractor shall label equipment racks, junction boxes etc. The labelling method shall be logical and conform to industry standards. All equipment racks and junction boxes shall be identified with commercially produced or machine printed alpha numeric labels. Hand printed labels are not acceptable.

Identification of chassis equipment shall be located in a suitable location within the rack and affixed to the rack, not the chassis.

Approved materials used for labels include lamicoyd strip, etched metal, stamped labels, or indelible ink.

3.4 Soldering

On solder connections, the insulation on individual wires shall not be stripped back more than 1.5 mm from the solder area.

Soldering shall be executed so that positive electrical and strong mechanical connections are assured.

Leads shall not be wrapped more than once around the terminal.

Soldered connections on the back of connector plugs, i.e. cannon plugs, switches, relay sockets or any other device employing solder lugs, shall be insulated by means of a short length of insulating tubing placed over each wire in the connector.

"Cold" solder joints, and excessive solder on connections shall not be acceptable.

Each soldered connection shall be tested for mechanical and electrical strength to ensure that a strong connection is achieved.

Use of acid based solder flux is not permitted.

Where insulation material is subject to heating during soldering, the material shall be undamaged and the fastened parts shall not be loosened.

3.5 Welding

All welds shall be free of harmful defects such as cracks, porosity, undercuts, voids and gaps.

There shall be no burn through.

Weld fillets shall be uniform, smooth, and shall cover a sufficient area of the welded surface to ensure that a solid bond is achieved.

Surfaces to be welded shall be free of extraneous particles which may affect the mechanical elements of the welded area.

3.6 Crimping

Crimp connections shall be made in accordance with the manufacturer's instructions. Industry standards shall be observed at all times.

Solid conductors may be used with crimp connections where the use of solid conductor wiring cannot be avoided. In all other cases only stranded wiring shall be used on crimp connections.

Solid conductors which are connected to terminals by crimping shall be soldered as well. This provision only applies to terminal lugs. It does not apply where wires may be spliced by crimping except in the case of some LED's and indicator lights which employ pigtail leads which should be soldered or connected by screw terminals.

3.7 Cleaning

Upon completion of the installation, the equipment shall be cleaned of smudges, loose or excess solder, weld beads, metal chips, burrs, mold release agents, or any other foreign material which might detract from the intended operation, function, or appearance of the equipment.

All corrosive materials shall be removed.

The cleaning processes employed shall leave no harmful residues and shall not have a negative effect on the equipment or its parts.

4.0 GROUNDING REQUIREMENTS

4.1 General

Grounding source and distribution points shall be provided by the Crown unless otherwise specified at the bidder's conference, in the Statement of Technical Requirement (STR), or any applicable documents.

The grounding shall be such that the signal ground, equipment ground, and electrical power ground shall be connected at one point and shall follow the shortest possible path. Where necessary, ground isolation techniques shall be employed.

The path from the tie point to any ground shall be permanent, continuous, have sufficiently low impedance to limit the potential above ground, and facilitate the operation of the 'over current' devices in the circuits.

Ground conductors shall be made of copper, sized for a minimum of 200 circular mils for each 300 mm length of conductor.

Inactive wires installed in long cable or conduit runs shall be grounded to prevent stray or static electrical discharges, with proper consideration given to prevent ground loops or other grounding problems.

Installation must be such that ground loops are prevented.

4.2 Signal Ground

Signal grounds shall be used to provide a ground potential reference which is independent of the frame ground and the power equipment ground.

An insulated grounding conductor shall be connected from the equipment signal ground terminal to the main ground connection point for single units such as equipment racks.
An insulated ground plate shall be used with insulated grounding conductors for multiple units, such as common equipment room (CER) equipment, from each equipment signal ground terminal connected to the plate. The plate shall be connected to the main ground connection point by means of a single insulated grounding conductor.

4.3 **Frame Ground**

The ground connection of the receptacle may be used for the frame ground as long as that ground connection is isolated and insulated from the power equipment ground system. Such receptacles shall be clearly identified so that they will not be used to supply equipment that does not require frame grounds.

The receptacle ground connection conductor shall be insulated and isolated from the power equipment grounding system, and shall be connected from the receptacle ground connection to an isolated ground plate.

The isolated ground plate may be an insulated buss bar for low power applications,.

Size of grounding conductors shall be in accordance with the requirements of CSA Standard C22.1 Section 10 and Table 17.

4.4 **Combined Signal and Frame Ground**

Connection between the signal ground terminal and the frame ground terminal shall be part of the equipment wiring. The connection to the main ground connection point shall be similar to that for a frame ground.

4.5 **Main Ground Connection Point**

Main ground connection point shall be installed in accordance with CSA Standard C22.1 Section 10, and C22.2 No. 41.

4.6 **Ground to Chassis**

Ground connections to an electrically conductive chassis or frame shall be made by:

a. soldering to a spot-welded terminal lug.

b. soldering to a portion of the chassis or frame that has been formed into a soldering lug.

c. using a terminal on the ground wire and securing the terminal by a screw, nut and lockwasher.

When using a terminal on a ground wire which is secured by a screw, nut and lockwasher, the screw shall fit in a tapped hole in the chassis or frame, or it shall be held in a through hole by a nut.

When the chassis or frame is painted, the metal around the screw hole shall be scraped clean and plated (or tinned) to provide a corrosion resistant connection.

4.7 Shielding

Shielding on wire and cable shall be grounded to the chassis or frame, in the manner specified in Section 2.5.5

4.8 Lightning Protection

All equipment with external cabling including radiating cables or other forms of antennas which may be susceptible during lightning strikes or other static discharges shall be protected fully in accordance with the relevant safety rules and regulations.

The ground rod used for lightning protection shall be copper or copper-plated steel, and shall be a minimum of 2.5 metres in length. Where the ground conditions preclude installation of a single ground rod, multiple rods of a shorter length may be used in parallel to provide the lightning protection.

The copper ground conductor shall be fastened to the ground rod using a thermic welding technique. Clamps are not acceptable.

5.0 ELECTRICAL/MECHANICAL DESIGN REQUIREMENTS

5.1 Design Considerations

All equipment shall be manufactured and finished with a degree of uniformity and grade of workmanship which shall comply with applicable industry standards, and the generally accepted principles of safe practice.

Exposed and moving parts that might constitute a safety hazard shall be provided with protective guards and warning labels.

All elements of the equipment shall be designed to operate in a highly reliable fashion, consistent with available technology, with a minimum of system downtime due to scheduled and unscheduled maintenance.

Where units or subsystems are integrated into common facilities, no single failure of a component, sub- assembly, assembly, or sub-system shall result in the failure of any other sub-system or reduced capacity or performance of other sub-systems or parts thereof.

The system shall be designed such that no failure of a single component, unit, subassembly, or subsystem will result in failure of the system or the next higher hierarchical elements.

All equipment shall be designed and installed to provide useful service, with minimal maintenance for a period of no less than 10 years, unless otherwise specified.

Tabletop or wall-mount power supplies or transformers shall not be used to power equipment installed within equipment racks and cabinets. Power supplies or transformers used within racks and cabinets shall be securely fastened to the rack equipment rails or side of the cabinet. DIN rail mounted power supplies are preferred.

5.2 Assemblies

The contractor (or manufacturing agent) shall apply special considerations in the execution of assembling system component parts.

Rack mounted equipment chassis; whose depth from the front face panel to the rear of the chassis exceeds 25 cm shall be equipped with rack slides.

Each assembly shall have a permanently fixed label showing the model number, serial number, and power requirements.

Materials used in assemblies shall be chosen with due consideration being given to the intended use, safety, durability, retention of appearance, and ability to resist corrosion from a variety of causes including tear gas.

In addition to applicable CSC/DES specifications, the appropriate industrial standards shall apply, including:

a. EIA-310-D Racks, Panels, and Associated Equipment.

b. CSA C22.2 No. 94-1976 Special Purpose Enclosures.

c. CSA C22.2 No. 29-M1983 Panel boards and Enclosures.

5.3 **Printed Circuit Board (PCB)**

PCBs shall be constructed of non-flammable material, preferably a glass epoxy base.

The contractor shall provide extractor devices at the front of each card assembly.
All cards shall have keyed edges to prevent accidental replacement by another type of card.

Each device shall be identified and properly labelled, showing card type, and revision number.

All PCBs shall be etched. Wire wrap connections are not acceptable.

In addition to the requirements set forth herein the appropriate industrial standards shall apply, including:

a. CSA C22.2 No.154-M1983 Data Processing Equipment.

b. CSA C22.2 No.0.7-M1985 Equipment Electrically Connected to a Telecommunications Network.

c. EIA RS-406/IPC-C-405A General Document for Connectors, Electric, Printed Wiring Boards.

5.4 **Components**

All electrical equipment, i.e. power supplies, amplifiers, etc. attached to the equipment structure shall be fastened securely and rigidly not using nuts and lockwashers.

Electrical components used in manufacturing in-house products shall be of commercial quality and shall comply with the standards of the Canadian Electrical Code, Part II.

Electronic circuit components, such as resistors, capacitors, inductors, or semiconductor devices which have no applicable standards in the Canadian Electrical Code, Part II shall comply with the test parameters as set forth in CSA C22.2 No. 154-M1983 Part 6.

6.0 QUALITY ASSURANCE REQUIREMENTS

The contractor shall provide objective evidence that the system and any major component therein have been designed, manufactured, inspected and tested under the umbrella of a quality assurance program capable of meeting the requirements of the applicable ISO Standard 9002 Series. More stringent requirements will be identified on a case by case basis, as needed.

In addition, the contractor shall develop a site-acceptance test/inspection procedure to demonstrate that all parameters of the system are fully operational and conform to the Statement of Technical Requirements.

6.1 In-plant Inspection

The equipment shall meet all functional, electrical, and visual/mechanical test parameters and shall have been fully tested and inspected by the contractor. Results shall be documented and reported to the Design Authority. Periodic inspections may be done by the Design Authority or his designated representative to verify that the equipment meets all requirements.

Particular attention shall be given to the following:

a. Inventory of received equipment.

b. Physical condition of equipment i.e.: scratches, dents, paint chips, etc . . .

c. Construction techniques, board and components accessibility.

d. Neatness, clamping and tying of wiring, cabling and harnesses.

e. Strain relief of cables and wire connections.

f. Legibility of nameplates, identification plates, and markings.

g. Safety and protective covers, warning labels and grounding.

h. Tightness of connectors, screw type fasteners, etc.

i. Soldered and weld joints.

j. Completeness.

k. Operation of drawers, adjustable and sliding parts, controls etc.

l. Shielding.

m. Cable and wire connections, ground clamps and terminal strips.

n. Type and quality of paint finish.

o. Quality of printed circuitry, etching, the electronic components and other associated parts.

p. Quality of locks, cabinets and other materials.

It must be noted that the in-plant tests are performed as a requirement of the financial arrangements and serve to guarantee that the design parameters of the FDR are followed and will meet the requirements of the applicable system specification. Sign-off of in-plant tests will not denote any form of final acceptance of the equipment and design.

6.2 Test Equipment

All test equipment shall be supplied by the contractor.
All instruments and test equipment shall be checked periodically by the QA Inspector in order to ensure accuracy of measurement. Records showing when the test equipment was last calibrated are to be provided as proof of accuracy.

6.3 Calibration

All test equipment used by the contractor shall bear a calibration seal showing the date calibrated and the due date for the next calibration.

The contractor shall ensure that the test equipment's calibration due date does not occur during the test period.

All equipment performance measurements shall be made with instruments whose accuracy and calibration guarantee that the results comply with the terms of the contract.

CSC reserves the right to furnish and/or require the use of any applicable instruments and standards in order to ascertain the accuracy of any measurements.

Test equipment suspected of being damaged or out of calibration shall be rejected by the Design Authority.

6.4 Safety Design Aspects

Particular attention is to be given to the safety design aspects of CSC installations, so as to minimize any hazards while in gaining access to, operating and servicing equipment. Such design aspects shall include the proper grounding of equipment, the installation of protective covers and warning labels over high voltage areas, the installation of warning labels on x-ray equipment, etc.

Radio and TV camera towers must receive careful attention in regards to make them accessible for servicing, especially during inclement weather.

7.0 ON-SITE INSTALLATION

7.1 Inspections

Inspections will be performed by the Design Authority or their designated representative. A thorough visual and mechanical inspection of the installation shall be performed to ensure that all applicable requirements and safety precautions have been met.

7.2 Damage to Government Property

Damage to Government property, including buildings, equipment, etc. during the course of the installation shall be made good by the contractor.

The contractor shall replace all equipment which has suffered major damage, i.e. damage which renders the equipment BER, unserviceable, or subject to deterioration.

If stocks of the applicable equipment are at such a level that replacement of the damaged items cannot be made, and the contractor cannot readily obtain new equipment in order to allow the installation to proceed without delay, the contractor shall:

a. repair the damage immediately with available materials.

b. return to the site and replace the equipment as soon as new equipment is procured.

Minor damage shall be repaired in a manner which leaves the government property in a condition equivalent to its original state and performing the original function, with no deterioration in appearance, performance, and/or reliability.

Any equipment where the paint finish becomes scratched or marred during the installation shall be completely refinished and repainted consistent with the appearance of new equipment.

Equipment shall neither be exposed to rain, nor be left out-of-doors during inclement weather. This stipulation does not apply to construction materials.

7.3 Protection of Surfaces

The contractor shall obtain approval from the appropriate Institution authority before moving heavy loads or equipment on floors, roofs and other surfaces.

The contractor shall adequately protect floors, finished surfaces and roofs from damage during the installation and shall implement special measures when moving heavy loads or equipment on them.

The contractor shall keep the floors free of oils, grease, or other materials likely to damage or discolour them.

The contractor shall provide dust protection for the equipment during the installation period, as related construction activities may occur simultaneously.

7.4 Cutting, Patching and Digging

The contractor shall perform all cutting, patching or digging necessary for the installation of the system.

The contractor shall be responsible for changes or damage to any existing work, cables or equipment by cutting, welding, drilling, or digging without prior consent from the Design Authority.

The contractor shall promptly repair any damage for which he is responsible in order to restore the facilities to their original condition.

7.5 Visual-Mechanical Inspection

Inspection shall be performed by the Design Authority or his designated representative.

Prior to the commencement of performance and operational testing, the installation shall be inspected to ensure that all applicable requirements and standards have been met.

Particular attention shall be given to the following:

a. Physical condition and positioning of equipment.

b. Neatness, clamping and tying of wire and cable harnesses.

c. Cable and wire connections, ground clamps, and terminal strips.

d. Soldered and welded joints.

e. Strain relief of cables, wire connections, and cable harnesses.

f. Cleanliness of equipment boxes under computer flooring.

g. Nameplates, identification methodology and markings.

h. Operation of drawers, adjustable and sliding parts and controls.

i. Equipment fit, fastening devices and accessibility of parts.

j. Construction and finishes.

k. Legibility of labels and tags.

l. Safety aspects, including secure provisions for climbing and working on towers.

m. Shielding.

n. Grounding.

o. Equipment Cooling Provisions.

p. Washers and lock-washers.

q. Tightness of screw type fasteners & connectors.

r. Screws, nuts and bolts shall show no evidence of cross-threading or mutilation.

s. Bottom of equipment racks etc. shall be free of debris and loose parts.

7.6 **Final System Acceptance**

The system shall be accepted when all of the following items have been completed to the satisfaction of the Design Authority and with the written certification of the project manager:

a. performance and operational tests.

b. all documentation.

c. all training.

d. all other terms and conditions.

The system warranty shall be deemed to begin at the completion of the Final System Acceptance or when the system is taken into service with accepted deficiencies, whichever comes first.

7.7 On-Site Maintenance

Building and site maintenance shall be interpreted to include all the areas in which the contractor is carrying out installation activities.

All sites and buildings shall be maintained by the contractor in a clean and tidy condition.

Upon completion of each day's work, all areas such as hallways, stairways, elevators and storage rooms used by the contractor in delivering or storing equipment shall be left in a clean and tidy condition.

The contractor shall store all electronic components not yet installed in a lockable storage room/trailer at the end of each workday. This procedure will reduce the probability of damaged and/or stolen equipment prior to system acceptance. Prior to the commencement of performance and operational testing, the installation shall be inspected to ensure that all applicable requirements and standards have been met.

8.0 DELIVERY

8.1 Packaging

All equipment shall be packaged to ensure that the equipment will not be damaged during shipment and/or delivery to the institution, as well as any associated handling on site.

Fragile components must be clearly identified and labelled.

All circuit cards, equipment modules, etc. shall be protected by the original packaging material until the equipment is placed into service.

8.2 Addressing

Address labelling shall be clearly marked in a minimum of two (2) locations on each package. The following format shall be observed:

a. Complete name of the institutional site.

b. Complete shipping address.

c. Clear description of contents.

d. Complete name of the Institutional representative.

All of the above addressing items will be provided at the Bidder's Conference.

- END OF TEXT -

Correctional Service Canada
Technical Services Branch
Electronics Systems

ES/SOW-0110
Revision 1
24 June, 2008

ELECTRONICS ENGINEERING STATEMENT OF WORK

STRUCTURED CABLE SYSTEMS FOR ELECTRONIC SECURITY INSTALLATIONS

AUTHORITY

This Statement of Work is approved by Correctional Service Canada for the procurement and installation of all telecommunications and electronic security systems, subsystems, and equipment in Canadian penal institutions.

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

Prepared by:

Manager,
Electronics Systems Research

Approved by:

Director,
Engineering Services
23 July 08

RECORD OF REVISIONS

Revision	Paragraph	Comment
0	Original	Original
1	4.3.1 - Cable	Cable upgraded to meet OM3 standards
	Multiple	Copper cable upgraded to CAT 6

TABLE OF CONTENTS

ABBREVIATIONS

The following abbreviations are used in this specification:

BICSI	Building Industry Consultant Service International
CER	Common Equipment Room
CET	Certified Electronic Technologist
COTS	Commercial -of-the-Shelf
CSC	Correctional Service Canada
CSA	Canadian Standards Association
CSV	Certified System Vendor
DVO	Data/Voice Outlet
EIA	Electronic Industries Association
EMT	Electrical Metallic Tubing
LOF	Laser Optimized Fiber
IDF	Intermediate Distribution Frame
OTDR	Optical Time Domain Reflectometer
RCDD	Registered Communications Distribution Designer
TC	Telecomm Closet
TIA	Telecommunications Industry Association
UTP	Unshielded Twisted Pair

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 Service Canada (PW&GSC) and/or the Materiel Management Division of CSC is responsible for all contractual matters associated with the system design and implementation.
Project Manager	A CSC employee or a contracted person designated by DES to be responsible for the test and evaluation or feasibility study project.
Project Officer	A CSC employee or a contracted person designated by DES to provide technical and/or engineering services in support of the project.
Contractor	The company is responsible for assuring that all system/equipment performance and test & evaluation requirements are met.
Off-the-shelf	Equipment which is commercially, complete with field reliability data, manuals, engineering drawings and parts price list.
Custom Equipment	Equipment designed and/or manufactured specifically for a specific contract.

APPLICABLE DOCUMENTS

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

a. EIA/TIA Standard EIA/TIA-568 Commercial Building Telecommunications Wiring Standard

b. EIA/TIA Technical Systems Bulletin TSB-36 Additional Cable Specifications for Unshielded Twisted Pair Cables

c. EIA/TIA Technical Systems Bulletin TSB-40 Additional Transmission Specifications for Unshielded Twisted Pair Connecting Hardware.

d. International standard ISO/IEC 11801-2nd Edition: Information technology — Generic cabling for customer premises.

Any other applicable industrial safety and control standards governing specific aspects for equipment and/or installations.

1.0 INTRODUCTION

1.1 General

This document defines the quality control requirements for the design, installation, testing and acceptance of structured cable systems for use in security systems installed in all Correctional Service Canada (CSC) facilities.

1.2 Scope

This specification has been developed to ensure high standards for the installation of electronic systems. It defines workmanship standards which may not be fully covered in subsidiary specifications. All contractor's documentation and installation procedures shall meet this specification for equipment reliability, maintainability, longevity, appearance and operational use.

1.3 Off-The-Shelf Equipment

The contractor shall provide commercial off-the-shelf (COTS) equipment wherever possible. COTS equipment shall meet or exceed the manufacturing standards as listed in this specification.

1.4 Manufactured Equipment

Where COTS equipment is unavailable or unsuitable for a specific application, the contractor may manufacture or arrange for the manufacturing of a particular item to suit the requirements. Manufactured equipment shall meet or exceed the best commercial equipment manufacturing standards.

1.5 Commonality of Equipment

The contractor shall provide commonality of hardware components within the design parameters ie. switch locks, racks, panels etc. All equipment, if appropriate shall be interchangeable.

2.0 MATERIAL AND EQUIPMENT REQUIREMENTS

2.1 Environmental Conditions

All materials and equipment which is used in CSC installations shall be equal to, or better than the standards established in the original equipment and shall be chosen with due consideration being given to the intended use, safety, retention of appearance, maintainability and durability under rugged operating conditions. These materials shall be suitable to perform over the following environmental ranges:

a. **Indoor Equipment**

Temperature: 0° C to 40° C; and

Humidity: 20% to 95% non-condensing.

b. **Outdoor Equipment**

Temperature: -40° C to +50° C; and

Humidity: 0 to 100%, condensing.

Outdoor equipment shall operate reliably and not be damaged by combinations of direct exposure to the sun, wind, rain, lightning, hail, snow and ice as may be expected to occur at each institution location.

Complete assemblies of indoor equipment shall be resistant to liquid spills, airborne contaminants, shock and vibration.

3.0 TELECOMMUNICATIONS OVERVIEW

3.1 Structured Cabling System

The design objective is a flexible network that is easy to re-configure, easy to manage and capable of incremental growth. The network is based on a structured cabling system conforming to Electric Industry Association/Telecommunications Industry Association Specification 568 (EIA/TIA-568) and Canadian Standards Association 529 (CSA 529) and using a star wired topology for the horizontal distribution with Category 6 Unshielded Twisted Pair (UTP) and 50/125 Micron Laser Optimized Fibre. The design will support Ethernet, Fast Ethernet, and network management.

4.0 DESCRIPTION OF WORK

4.1 General System Requirements

4.1.1. Outline

This section defines the minimum requirements for a structured cabling system to be provided on an engineered, furnished, installed, tested, and commissioned basis. Products and installation practices shall conform with the EIA/TIA documents identified in the **APPLICABLE DOCUMENTS** section of this Statement of Work.

The structured cabling system includes the following basic elements arranged into backbone feeders and horizontal distribution subsystems that are cross connected or patched together in Telecom Closets or Common Equipment Rooms on Intermediate Distribution Frames (IDFs).

a. Unshielded Twisted Pair (Horizontal)
b. 8-pin modular Telecom outlets
c. Insulation displacement connector type terminal blocks
d. LOF optic cable (Backbone)
e. Fibre optic (duplex) interconnect patch panels
f. Patch cords for patch panels
g. Line cords for workstation data equipment (Office Cables)

Notes:
1) 3 metre length is standard for Office Cables
2) All cables provided for a project shall have a **GREEN** jacket.

4.2 Horizontal Data Cable

4.2.1 Cable

Each cable shall consist of 8 each of 24 AWG thermoplastic insulated solid copper conductors formed into four individually twisted pairs and enclosed by a jacket with the appropriate protection rating determined by Provincial codes.

The cable shall fully conform with EIA/TIA-568 design requirements for 100 ohm UTP cable and fully conform with EIA/TIA-568 TSB-36 transmission requirements for Category 6 cable. Cables shall bear evidence of verified Level 6 or Category 6 and also bear evidence of certification by a recognized standard or testing body. (eg: Bearing NORDX Brand name and have length clearly marked on cable sheath)

The cable bundles will be fed to locations in either a supplied cable tray or conduit system. Outlet cables will then be fed to the user locations via either pac poles or fished down hard wall offices. A pull string will remain in the conduit/cable tray for future installations.

The cable run length from the IDC to the workstation location shall NOT exceed 90 metres. The combined length for patch cords for data network horizontal distribution connections shall not exceed 10 metres for an overall length from data network hub equipment to workstation equipment not exceeding 100 metres.

4.2.2 **User Termination**

Termination at the user end will be made onto a certified Category 6 RJ45 module for data. These modules will then be housed in a certified faceplate. The faceplate to house the modules will have the capability to equip up to six each 8 pin modular jacks. Other configurations to be used will vary with locations: A duplex flush mount faceplate for drywall applications, a duplex surface mount kit for PAC pole applications and duplex single gang outlets mounted into custom furniture with adapter plates. Surface mount kits will not exceed a 6.5 cm. protrusion from the wall. For custom furniture it is assumed that the cable runs will be fed to the outlet via raceways in the legs of furniture. For security reasons, jacks are NOT be installed in exterior walls or walls not totally part of CSC space. All cables must either terminate on a patch panel or on a faceplate, loose or unterminated cables are not acceptable.

The 8 pin modular jack connectors shall comply for termination of 4 wire pairs with 24 AAWG solid copper conductors: minimum contact force of 100g and conductors separated by jack comb.

Each modular outlet will be wired per EIA/TIA-568 polarization sequence, designation T568A (reference CAN/CSA T529 Clause 11.2 Figure 11-1 and Table 10-1).

This illustration is a front view of the connector

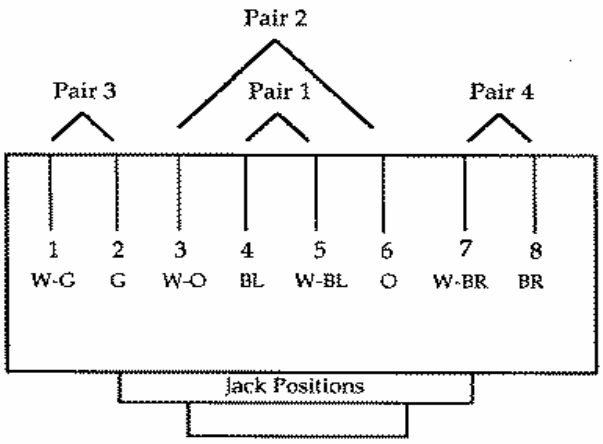

Figure 11-1
Eight-Postion Jack Pin/Pair Assignments
(T568A Type)

Figure 11-1 and Table 10-1 outlines the sequencing required to construct line, office, and patch cables.

Each modular outlet will conform with EIA/TIA TSB 40 transmission requirements for Category 6 and will also be compatible with existing standard electrical outlet boxes.

Table 10-2 outlines the correct punch down positioning when using Northern Telecom T568A BIX DVOs' , T568A ISDN QCBIX36DI and T568A ISDN QCBIX46DI Modular Jack Connectors, and T568A QPBIX Modular Patch Panels.

Table 10-1

Colour Codes for patch, line, and office cables

Colour Identification	Colour Code	Abbreviation
Pair 1	White-Blue	(W-BL)
	Blue	(BL)
Pair 2	White-Orange	(W-O)
	Orange	(O)
Pair 3	White-Green	(W-G)
	Green	(G)
Pair 4	White-Brown	(W-BR)
	Brown	(BR)

Table 10-2

Colour Codes for punch down and modular outlets

Position	Colour Code	Abbreviation
1	White-Blue	(W-BL)
2	Blue	(BL)
3	White-Orange	(W-O)
4	Orange	(O)
5	White-Green	(W-G)
6	Green	(G)
7	White-Brown	(W-BR)
8	Brown	(BR)

4.2.3 Closet Termination

Supply and installation of RJ45 Category 6 hardware for system connection in communications closet using 24 NT certified patch panels rack mounted with cable organizer panels installed for each patch panel.

Active components will be connected to equipment by 8 conductor patch cords manufactured to CAT 6 compliance. Patch cords shall be stranded conductor and have a “no-snag” boot over the RJ45 connector.

Multi-Level building installations will require individual patch panels be installed for each level of the building. Patch panel(s) for each level of a multi-level building must have at least 15% unused ports. The same holds true for single story, multi ICC buildings.

4.2.4 Cable Protection

All ceiling distribution cabling shall be enclosed and protected by 3/4” and 1” rigid conduit from communications closet(s) room(s) and cabinets to all user outlets located in inmate accessible areas. In areas that CSC designated as non inmate accessible, EMT zone conduit will be allowed. Conduits must have end bushings installed to protect the cable from sharp edges.

Conduit containing Copper backbone cable must be designated “CAUTION SECURITY SYSTEM CABLE”

Conduit containing Fibre Optic backbone cable must be designated “CAUTION FIBRE OPTIC SECURITY SYSTEM CABLE”

4.2.5 Line Cords

The cabling company will supply RJ45, 8 pin modular line cords to connect owner provided data equipment to the horizontal distribution outlets at the workstation. They must be consistent with CAT 6 specification and provide end-to-end CAT 6 connectivity. Line cords shall be stranded conductor and have a “no-snag” boot over the RJ45 connector.

4.2.6 **Testing**

All cables/pairs will be scanned with a MicroTest Penta cable scanner or equivalent at 100 Mbs to determine DC loop resistance, near end cross talk and attenuation to meet or exceed the performance stated in EIA/TIA TSB-36 and TSB-40, noise, pair mapping and ranking. These tests must be conducted as originating from both the punch down location and modular outlet location of each cable segment.

4.2.7 **Labeling**

All jacks must be identified by means of labels with unique numbers These markings will be made with printed labels. The Correctional Service of Canada expects that all drops at the user end will be sequential and not out of order.

The closet terminations must be identified with these same numbers marked on BIX labels adhered to BIX 20A designation strips and patch panels. The CAN/CSA 568 colour code will apply.

Labels will also be placed on the horizontal wire, 6-9” from termination points. This would include closets, main cabinet, and jacks.

4.2.8 **Documentation**

Customer to supply CAD or Visio Version 5 floor plans when available. If CAD documents are not available, contractor will be responsible to scan hard copy of plans.

Contractor to supply site plans, individual runs, risers, wire #’s, jack #’s, patch panel #’s in both hard and soft copy.

All test results shall be machine printed, hand written test result sheets are NOT acceptable.

4.3 **Fibre Optic Backbone Cable**

4.3.1 **Cable**

The cable to be supplied and installed for backbone purposes shall consist of 12 strands (6 pairs) of Laser Optimized Fibre with nominal 50/125 um core/cladding diameter formed into a single cable.

Optical cable shall physically conform with ANSI/ICEA S-83-596 mechanical and environmental specifications for outdoor fibre optic cable.
Fibre optic cable shall conform with the requirements of OM3 as per the ISO 11801-2nd Edition standards

4.3.2 **Terminations**

Fibre optic cables shall be terminated to SC Physical contact Connectors shall be able to sustain a minimum of 200 mating cycles per EIA/TIA-455-21 without violating specifications. These connectors will terminate within interconnect sleeves to facilitate patching in patch panels. The maximum optical attenuation per pair of mated connectors shall not exceed 0.75 db.

All fibre strands, whether used in the project or not, shall be terminated with SC type connectors and installed into a fibre patch panel: generally one duplex patch per cable (i.e. 12 connectors per panel for 12 strand fibre cable). Please note that these cables shall be SC to ST unless otherwise noted.

The patch panel proposed shall provide strain relief for each fibre as an integral part of the panel design. This standard type and size of panel should be uniformly used throughout the project.

Installed fibre panels shall be completed with all guides, brackets and other accessories to facilitate cable cross connect to active components for administration and management, including provisions for labeling that are consistent with EIA/TIA-568.

4.3.3. **Testing**

All terminated fibre media and related connecting hardware shall be tested with a power meter and certified at the conclusion of the initial installation with an OTDR, in both directions. Testing will include end-to-end attenuation testing that shall measure each fibre in one direction and compare with the calculated loss based on the manufacturers specifications and known length of cable using 850 nanometres and 1300 nanometres wavelengths. The difference in value between any two mated fibre shall not exceed 0.5 db.

The power levels of the terminated fibres shall be documented to allow the equipment vendor to select the correct strapping options for their equipment. This will prevent the receivers from being overloaded.

If the attenuation measurements are not within the required specifications, an Optical Time Domain Reflectometer shall be used to find the cause and location of the power loss. Any failure will be rectified.

All test results to be machine printed, and documented in duplicate and delivered complete with As-Built drawings to Corrections Canada Regional Office.

The fibre optic cable testing will also include a basic light test:

- on each of the fibres before installation to ensure that no damage had occurred during shipping;
- on each of the fibres before termination to ensure that no damage had occurred during installation.

4.3.4 **Labeling**

All fibre optic cables will be identified by means of Warning Labels located on all related conduit, pullboxes and backboards.

Both ends of all fibre cables will be labeled indicating destination and number of strands.

All ports on each Fibre optic patch panel will be labeled to identify the backbone destinations. Both ends will be labeled with this same numbering scheme.

4.4 **Cross Connect**

4.4.1 **Data Cross-connect**

Cross connection of the UTP horizontal cables to the tie field will be completed after testing of installed cables has taken place.

Jumper wire shall be provided, if requested, and will conform with EIA/TIA TSB-40 transmission requirements for Category 6.

Correctional Service Canada
Technical Services Branch
Electronics Systems

ES/SOW-0502
Revision 2
8 July, 2004

ELECTRONICS ENGINEERING STATEMENT OF WORK

ELECTRONIC SYSTEMS/EQUIPMENT TEST & EVALUATION GUIDELINES

AUTHORITY

This Statement of Work is approved by Correctional Service Canada as guidelines for electronics engineering services for the conduct of test, evaluation and feasibility study of all telecommunications and electronic security systems, subsystems, and equipment in Canadian penal 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:

Manager,
Electronic Systems Research

Approved by:

Director,
Engineering Services

JUL 14 2004

TABLE OF CONTENTS

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 Service Canada (PW&GSC) and/or the Materiel Management Division of CSC is responsible for all contractual matters associated with the system design and implementation.
Project Manager	A CSC employee or a contracted person designated by DES to be responsible for the test and evaluation or feasibility study project.
Project Officer	A CSC employee or a contracted person designated by DES to provide technical and/or engineering services in support of the project.
Contractor	The company is responsible for assuring that all system/equipment performance and test & evaluation requirements are met.
Off-the-shelf	Equipment which is commercially, complete with 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 Scope

The purpose of this Statement of Work (SOW) is to provide guidelines for the effective conduct and management of successful tests and evaluations or feasibility studies of technologies proposed for use in Correctional Services Canada (CSC).

Any commercially available equipment or new technologies which are proposed for use in CSC require type-approval by the Technical Authority prior to being procured and installed into a CSC facility. The type-approval process may involve an extensive formal testing and evaluation or feasibility study to ensure adherence to CSC equipment standards, specifications and/or suitability to the CSC operational environment.

Tests and evaluations or feasibility studies will provide the Technical Authority with:

a. the assurance that new technologies or new systems/equipment meets the stated performance requirements:

b. the verification of system/equipment conformance to CSC system specifications and standards requirements; and

c. the acceptability of the systems to function in the CSC operational and environmental requirements.

1.2 CSC Operational Environment

The correctional institution environment has a crucial bearing on the ability of any system/equipment to function and perform its intended role. The construction and the building materials used to ensure a high physical secure facility greatly affect the normal propagation patterns of radiated signals in wireless systems. High reliability and high state of readiness 24 hours per day seven days per week are essential for the safety and protected of both operational staff and the inmates. Equipment ruggedness, ability to handle shock and vibrations are essential for systems being transported by vehicle or worn by operational staff.

The extreme and variation of weather conditions greatly affect the ability of any outdoor system to survive and function on a continuous basis. Although the requirements may vary from system to system, in general any system being considered for a CSC application must be able to maintain operation in the following conditions typically:

Temperature: -40° C to 55° C (outdoor equipment), 0° C to 50° C (indoor equipment);

Humidity: 0 to 100% non-condensing (outdoor equipment), 0 to 95% non-condensing (indoor equipment);

Exposure to direct sunlight; Wind velocity up to 100 km/hour; Rainfall up to 25 mm/hour; Hail stones up to 2 cm in diameter; Temperature changes causing expansion and/or contraction of the metal material; Snowfall up to 30 cm/hour; Snow accumulation up to 50 cm; Ice build up on equipment up to 2 cm; Lightning strikes outside a radius of 1 km and any site specific phenomena as may be expected and/or published in other documents.

1.3 Technical Authority

The Technical Authority is the Director, Engineering Services (DES). Any on-site test and evaluation and/or feasibility study which is provided on behalf or by engineering services shall be subject to the acceptance and approval of the DES.

The Technical Authority will:

a. determine and approve the electronic systems/equipment to be tested and evaluated or feasibility studied;

b. define the test and evaluation or feasibility study requirements, including the pass/fail criteria;

c. review and approve the test and evaluation procedures to be used on the equipment:

d. define, advise upon, provide and arrange for the use of the correctional site for the conduct of the test and evaluation;

e. coordinate, supervise or monitor the test and evaluation or feasibility study being conducted by the company; and

f. ensure that there is no operational impact during the test and evaluation period.

Electronic security system on-site evaluation and/or feasibility study projects are normally the responsibility of the Manager, Electronic Systems Research MESR). The MESR is normally the designated CSC PM for contracted services on these projects. The DES may designate other CSC staff members to be responsible for specific evaluation and study projects.

1.4 Company/Contractor

The company/contractor conducting the system/equipment evaluation shall be responsible for:

a. assuring that all the Technical Authority test and evaluation requirements are met;

b. developing the test plan; test schedule and test procedures for the Technical Authority approval; and

c. conducting the test procedures and preparing the test report.

2.0 APPLICABLE DOCUMENTS

The following Statement of Works (SOWs) of the issue in effect shall form part of this SOW:

a. ES/SOW-0103 Design Criteria for Electronic Systems;

b. ES/SOW-0104 Design Criteria for Maintainability and Safety of Electronic Systems;

c. Specifications Applicable CSC system specifications; and

d. Standards Applicable CSC equipment standards.

3.0 REQUIREMENTS

3.1 Specified Requirements

All system components are to be tested or evaluated in accordance with CSC system specifications and equipment standards specified in Section 2.0 of this document. Any requirements that cannot be tested or require clarification shall be brought to the attention of the Technical Authority prior to the commencement of the evaluation.

3.2 Test Plan

A test plan shall be developed for the Technical Authority by the company/contractor proposing the system/equipment for evaluation. The test plan shall provide:

a a description of the organization and management of the test team;

b scheduling information and timing for the system/equipment under the test;

c. summaries of the individual test events and each test objective;

d. identify items to be tested along with the test conditions and environment;

e. a set of pass/failure criteria; and

f. identify data collection, analysis techniques and reporting requirements.

3.3 Test Schedule

A test schedule shall be developed for the Technical Authority by the company/contractor proposing the system/equipment for evaluation. The test schedule shall provide timings of particular tests or project milestones.

3.4 Test Procedures

Test procedures shall be developed for the Technical Authority by the company/contractor proposing the system/equipment for evaluation. The test procedures shall provide to following as a minimum:

a. detailed information necessary for the conduct of the tests.

b. the characteristics to be measured, including tolerances.

c. outline of the statistical data analysis methods and procedures when necessary

d. identify input values, load values and outputs.

e. lists of test equipment, recording equipment and software used to run the test apparatus.

f. test apparatus set up information and pretest checkout requirements.

g. data recording instructions, actions to be taken in the event of test interruptions, acceptance/rejection criteria; and

h. appropriate safety precautions for personnel and test equipment.

3.5 Test Reports

Test reports shall be prepared by the company/contractor proposing the system/equipment for evaluation. Test reports shall be composed from a number of data sources such as test logs, recorded data and observations. The test report shall provide:

a. the recorded test results of each test;

b. information on test discrepancies and variations of test procedures. Where discrepancies and variations occur, the underlying assumption and rationale must be reported.

Test report formats shall be provided by the contractor and approved by the Technical Authority.

4.0 TEST & EVALUATION

Test and evaluation of commercially available products or newly developed technologies will normally be conducted at a CSC facility which is both technically and operationally suitable for the technology. The Technical Authority will coordinate the test and evaluation requirements with the appropriate CSC regional and institutional staff prior to the commencement of any test and evaluation project.

The test and evaluation requirements shall be in accordance with Section 3.0 of this document.

4.1 Research, Feasibility and Engineering Studies

Research, feasibility and engineering studies shall be conducted to demonstrate that the new product and/or technology is suitable to satisfy an existing or new CSC operational requirement. The study may be conducted at the contractor's facility. Any requirement to visit a CSC facility during the study will be coordinated by the Technical Authority.

The study will normally involve:

a. performing a market search of the available, applicable regulatory type-approved, or CSA approved equipment/systems to determine potential products suitable for CSC security operational applications.

b. performing a cost analysis for each of the potential products and/or technologies. The analysis shall include the following items:

- technological features,
- performance and/or operational limitations,
- installed costs, and
- operational costs.

c. visiting and consulting with the appropriate CSC staff as directed by the Technical Authority to review the operational requirements and limitations.

d. considering:

- equipment technical limitations,
- compatibility with other CSC electrical and electronic systems,
- any licensing requirements (communications systems),

e. providing a cost/benefit analysis.

4.2 Qualification Testing

Qualification testing shall be conducted to demonstrate that the equipment/system has the ability to meet its stated performance under specific environmental and operational conditions. If new products or new technologies have been qualified to the same environmental operational conditions and/or meet applicable Military Standards and a certificate of qualification is available, qualification testing may be considered completed.

If the new equipment/system has not been subjected to the specific environmental and operational conditions, the Technical Authority will insist that qualification testing be conducted before the system will be considered for a CSC application.

4.3 Human Engineering and Safety Tests

Human engineering and safety testing shall be conducted to demonstrate that the equipment/system has no harmful impact on human performance under specific environmental and operational conditions. If new products or new technologies have been proven in the same environmental and operational conditions and/or meet applicable Military Standards, human engineering and safety testing may be considered completed.

If the new equipment/system has not been subjected to human engineering and safety tests under the specific environmental and operational conditions, the Technical Authority will insist that these tests be conducted before the system will be considered for a CSC application.

4.4 Reliability Tests

Reliability testing shall be conducted to demonstrate that the equipment/system can achieve a specific reliability requirement under specific environmental and operational conditions. If new products or new technologies have been proven a high reliability in the same environmental and operational conditions and/or the manufacturer can provide the required Mean-Time-Between-Failure (MTBF) rates, the equipment/system may be considered acceptable.

If the new equipment/system has not been subjected to reliability testing under the specific environmental and operational conditions, the Technical Authority will insist that these tests be conducted before the system will be considered for a CSC application.

4.5 Maintainability Tests

Maintainability testing shall be conducted to demonstrate the maintainability parameters. The usual test parameters are Mean-Time -To-Repair (MTTR) and the Maximum-Repair-Time (MRT) by technicians with a specific level of skill on the maintenance of the system. If new products or new technologies have demonstrated good maintainability parameters and/or the manufacturer can provide the required MTTR and MRT rates, the equipment/system may be considered acceptable.

If the new equipment/system has not been subjected to maintainability testing by specific level of skilled technicians, the Technical Authority will insist that these tests be conducted before the system will be considered for a CSC application.

4.6 Proof of Compliance

Proof of compliance testing demonstrates that the system meets the minimum operational performance as set forth in the applicable CSC specifications. Proof of system compliance or noncompliance to CSC operational requirements will normally be the results of a successful test and evaluation program.

Only new products or new technologies which have demonstrated proof of compliance will be considered acceptable and suitable for a CSC application.

4.7 On-Site Acceptance Testing

All electronic security systems/equipment installed into a CSC facility is subject to acceptance testing. This testing will ensure that the installed overall system meets a predetermined technical and operational standard and that it has been installed according to the applicable CSC Specifications, Standards and Statements of Work. Acceptance testing is conducted by the contractor and witnessed by the Technical Authority. The successful completion of acceptance testing is the last phase of system installation and marks the start of the warranty period and the handover of the new system to operations.

5.0 TEST AND EVALUATION METHODOLOGY

It is important that the contract/company fully understands the CSC interpretation of the test and evaluation verification methods. The verification methods used by the CSC Technical Authority are defined as follows:

5.1 Inspections

Inspections are used to determine the system's/equipment's characteristics by examination of and the comparison with engineering design drawings to verify compliance with specified technical and operational requirements. Inspections are generally nondestructive and mainly consist of visual examinations or simple measurements.

5.2 Tests

Tests are used to verify conformance of the system's/equipment's functional characteristics with technical and operational requirements by subjecting the system/equipment to precise measurement equipment and procedures. Evaluation analysis or technical review is performed on the recorded data derived from the testing.

5.3 Analysis

Analysis is a method of verifying of system's/equipment's characteristics with the specified requirements without exercising the actual hardware. This method of verification is used where quantitative performance cannot be demonstrated cost-effectively. Examples of this analysis include computer simulations or the calculation of system/equipment parameters from subsystem data.

5.4 Demonstrations

Demonstrations are normally used to verify conformance of system's/equipment's functional characteristics with specified requirements by some pass/fail criteria without the use of elaborate measurement equipment.

Correctional Service Canada
Technical Services Branch
Electronics Systems

ES/SPEC-0006
Revision 2
14 January, 2002

ELECTRONICS ENGINEERING

SPECIFICATION
CONDUIT, SPACE AND POWER REQUIREMENTS FOR SECURITY SYSTEMS FOR USE IN FEDERAL CORRECTIONAL INSTITUTIONS

AUTHORITY

This Specification is approved by the Correctional Service of Canada for the procurement and Installation of Conduits for Electronic Security Systems 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:

Manager,
Electronics Systems Research

Approved by:

Director,
Engineering Services

TABLE OF CONTENTS

ABBREVIATIONS

The following abbreviations are used in this specification:

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
EMT	Electrical Metallic Tubing
GFE	Government Furnished Equipment
MCCP	Main Communications and Control Post
PVC	Polyvinyl Chloride
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 requirements for the design and installation of conduits, cable troughs and raceways as well as space and power requirements for telecommunications and electronic security systems in the Correctional Service of Canada (CSC) facilities.

1.2 Scope

This specification has been developed to ensure high standards for the installation of conduits, cable troughs and details equipment space and power requirements for electronic systems. It defines workmanship standards which may not be fully covered in subsidiary specifications. All contractor's documentation and installation procedures shall meet this specification for reliability, maintainability, longevity, appearance and operational use.

1.3 Off-The-Shelf Equipment

The contractor shall provide commercial off-the-shelf (COTS) materials wherever possible. COTS materials shall meet or exceed the manufacturing standards as listed in this specification.

Where COTS material is unavailable or unsuitable for a specific application, the contractor may manufacture or arrange for the manufacturing of a particular item to suit the requirements. Manufactured materials shall meet or exceed the best commercial equipment manufacturing standards.

1.4 Equipment Procurement

Any ordering of material before the approval of the system 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.

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 Procurement and Installation of Electronic Systems
ES/SOW-0102	Statement of Work for Quality Control of Electronic Systems
EIA-310-C	Electronic Industries Association Standard for Racks, Panels and Associated Equipment.
CSA C22.1	Canadian Electrical Code - Part 1 Safety Standard for Electrical Installations
CSA C22.2	Canadian Electrical Code - Part II

3.0 REQUIREMENTS

3.1 General

The contractor shall supply all necessary conduits, cable troughs and raceways and any other items that may be required for the satisfactory completion of the specified project. All installation workmanship shall be performed in accordance with the Statement of Work, Standards specified in Section 2.0 of this specification and all applicable national, provincial, and local electrical codes.

A conduit diagram shall be supplied in the installation documentation to detail where connections terminate and how conduits are routed and terminated.

Conduits, ducts, trays, etc. may be either Government Furnished Equipment (GFE) or supplied and installed by the contractor depending on the particular institution. The determination will be made by the Design Authority and will be identified in the STR.

The contractor shall provide Electronic Industries Association (EIA) standard racks, panels and associated hardware according to the space requirements of this specification.

The contractor shall provide all necessary wiring, circuit panels, circuit breakers and associated hardware according to the power requirements of this specification.

3.2 Environmental Conditions

All materials and equipment which are used in CSC installations shall be chosen with consideration being given to the intended use, safety, retention of appearance, maintainability and durability under rugged operating conditions. These materials shall perform over the following environmental ranges:

a. **Indoor Equipment**

Temperature: 0° C to 50° C; and

Humidity: 20% to 95% non-condensing.

b. **Outdoor Equipment**

Temperature: -40° C to +55° C; and

Humidity: up to 100% condensing.

3.3 Conduits, Cable Troughs and Raceways

3.3.1 Conduits

Conduits installed above ground, and accessible to the inmate population, shall be rigid steel. Metal conduits installed in secure and inmate accessible areas shall be fitted with double the normal quantity of support hangars.

In locations subject to extreme temperature changes, and/or where conduit lengths are of non-standard size, the contractor shall make provisions for the inclusion of conduit expansion joints.

Outdoor conduit shall not be damaged by combinations of direct exposure to the sun, wind, rain, lightning, hail, snow and ice as may be expected to occur at each institution location.

Rigid Polyvinyl Chloride (PVC) conduits shall be used only in buried applications. Rigid PVC conduits shall not be threaded, but may be used with approved adapters and couplings applied in a manner consistent with industry standards. PVC conduits which cross roadways shall be encased in poured concrete. The contractor shall provide a suitable means of protecting the buried conduit against damage caused by digging or excavating. The preferred method is installing a tape marker directly above the conduit path.

Electrical Metallic Tubing (EMT) conduit may be used in administrative areas, and locations which are not normally assessable to the inmate population.

Liquid-tight flexible metal conduits may be used where a flexible connection is required, ie. cameras, microwave dishes, etc. In such applications, the length of "flex" conduit shall not exceed one (1) metre.

In addition to these requirements, the latest issue of applicable industrial standards apply, including:

a. CSA Standard C22.2 - Rigid Metal Conduit

b. CSA Standard C22.2 - Flexible Metal Conduit

3.3.2 Cable Troughs and Raceways

Cable troughs and raceways shall be continuous and shall be constructed of metal. The contractor shall provide adequate mounting devices which will permit the use of fastening devices that will not damage conductor insulation.

Cable troughs, raceways, and fittings shall be free from burrs or other sharp edges which may cause damage to the cable or insulated conductors. All troughs and raceways shall be installed as a complete system before the conductors or cables are installed.

Cable troughs may be either ventilated or solid and unless otherwise specified, shall be equipped with covers and steel guards to protect against damage.

In addition to these provisions, the latest issue of appropriate standards shall apply, including:

a. CSA Standard C22.2 - Cable Troughs and Fittings.

b. CSA Standard C22.2 - Raceways and Fittings.

c. CSA Standard C22.2 - Surface Raceways and Fittings.

4.0 SYSTEM REQUIREMENTS

Summary tables of the electronic security systems minimum conduit, space and power requirements are provided as Appendix A, Appendix B and Appendix C respectively to this specification.

4.1 Perimeter Intrusion Detection Systems

4.1.1 Motion Detection System

The Motion Detection System (MDS) is designed to detect motion between the fences. One system which is type approved for use in CSC uses the Leaky Coax - buried cable technology. The perimeter is divided into sectors and two sectors are controlled by a single local control module. Signal and power fed to the field mounted electronic controllers via the buried coax cables. The main MDS control modules are installed in the common equipment room (CER).

4.1.1.1 Conduit Requirements

Cable entry to the area between the two perimeter fences is made at a single point, usually at the gatehouse. One (1) 38 mm conduit is required from the CER to the area between the two perimeter fences. This conduit is stubbed underground between the fences several meters from the gatehouse.

4.1.1.2 Space Requirements

The MDS control equipment will normally occupy about half of the area of a 2.483 meter rack, usually supplied by the PIDS contractor.

4.1.1.3 Power Requirements

The power requirement for the MDS equipment in the CER is a 110.0 VAC, 15.0 ampere, uninterruptable power supply.

4.1.2 Fence Disturbance Detection System

The Fence Disturbance Detection System (FDS) is designed to detect particular movement and vibration patterns on the inner perimeter fence. This is accomplished by mounting electro-mechanical fence sensors (geophones, electret or piezoelectric vibration detectors) on the fence. The perimeter is divided into sectors and one array of sensors covers one sector. The cables from all the sectors are run along the top of the fence to the gatehouse and to the control equipment mounted in the CER.

4.1.2.1 **Conduit Requirements**

FDS cable entry to the inner perimeter fence is made at a single point, usually at the gatehouse. Depending on the size of the perimeter and the number of sectors, the requirement is for a minimum of one (1) 38 mm conduit from the gatehouse to the top of the inner fence. The conduit is capped with a weather proof cable outlet.

4.1.2.2 **Space Requirements**

The FDS control equipment will normally occupy approximately half of the area of a 2.483 m rack supplied by the contractor.

4.1.2.3 **Power Requirements**

The power requirement for the FDS equipment in the CER is a 110.0 VAC, 15.0 ampere, uninterruptible power supply.

4.1.3 **PIDS Microwave**

Bistatic microwave (beam) systems are normally installed across the pedestrian and vehicle entrance portals (sallyports) to detect movement in the area. The microwave systems are integrated into the PIDS motion detection system. These systems allow small portal sectors to be turned off to allow authorized staff and vehicle access without effecting the entire perimeter security.

4.1.3.1 **Conduit Requirements**

Microwave cable to each of the pedestrian and vehicle sallyport areas are required from the closest motion detection system (MDS) local control module. One buried (1) 19 mm PVC conduit is required from each sallyport to the closest perimeter MDS unit.

4.1.3.2 **Space Requirements**

The control equipment will normally occupy approximately 0.5 metre of rack space supplied by the contractor.

4.1.3.3 **Power Requirements**

The power requirement for the microwave equipment in the CER is a 110.0 VAC, 15.0 ampere, interruptible power supply.

4.1.4 PIDS Closed Circuit Television

Closed Circuit Television (CCTV) monochrome cameras are placed in strategic positions around the perimeter fence. The cameras monitor the institutional side of the inside perimeter fence and the area between the fences. When there is an alarm on the FDS and/or MDS, the CCTV cameras monitoring the appropriate sector inside fence and between the fences are selected for viewing. During an alarm period the video displayed on the monitors from the selected cameras are recorded on a time-lapse video cassette recorder.

The CCTV cameras are usually grouped at the corners of the perimeter and mounted on self supporting towers. 110 VAC power is provided to an VAC distribution panel mounted at each corner of the perimeter. VAC power is distributed to the cameras.

External vertical synchronization of the CCTV cameras is by the distribution of an independent vertical pulse to all the cameras and components of the system.

4.1.4.1 Conduit Requirements

CCTV Signal and Control. Two (2) 50 mm conduits run from the CER to the cameras in the corners of the perimeters in both directions. These conduits for the CCTV camera signal and control wiring terminate in a exterior distribution box mounted on the closest camera towers. Two (2) 50 mm conduits run around the perimeter terminating at each of the camera groups at the perimeter corners.

CCTV AC Power. Two (2) 38 mm conduits are required from the power distribution panel in the CER to the power junction box on the closet perimeter camera tower. One conduit is required to run in both directions. VAC power is required for the cameras and the heater and wipers in the camera housings. One (1) 38 mm conduit is required to run form the power junction box around the perimeter providing power to each camera group.

4.1.4.2 Space Requirements

The video distribution and switching equipment in the CER require approximately 1.0 m of rack space.

The four video monitors, wiper control and camera on/off switch panels in the MCCP console require space in one (1) EIA standard console cabinet..

A separate standalone rack in the MCCP is provided to accommodate five (5) time lapse VCRs.

4.1.4.3 Power Requirements

The power required in the CER for video switching and control equipment is one 110.0 VAC, 15.0 ampere uninterruptible power supply.

The power requirement for the perimeter cameras is a 110.0 VAC, 20 ampere supply to each group of usually four (4) cameras from the power distribution panel in the CER.

A camera and housing requires 300 watts each, including heaters, wipers and all other the environmental control units for the camera housing units.

4.1.5 MCCP Console

The control and annunciation equipment for the PIDS and the Facility Alarm Annunciation System are mounted in the console cabinets in the MCCP. The control and annunciation units are normally connected to processing equipment in the CER by cables running under the computer flooring. There is a requirement for rigid conduit between the MCCP and the CER for the 110 VAC uninterruptible power supply (UPS).

4.1.5.1 Conduit Requirements

One (1) 19 mm conduit is required from the UPS location in the CER to the MCCP console.

4.1.5.2 Space Requirements

The console cabinet space requirement will depend on the number of systems provided at the institution and usually consists of six console racks in the MCCP joined together to form the control console. One medium equipment rack for the maintenance video display unit (VDU) and a low profile cabinet with sliding shelves for the time-lapse VCRs and printer.

The MCCP will require a room with a floor area of no less than approx. 23.6 square metres. The CER will require a room with a floor area of no less than 9.0 square metres for the equipment and approx. 6.3 square metres for spare equipment storage and maintenance. Both rooms require computer flooring, all conduits entering will be stubbed or terminated under the computer floor. Both rooms need to be as square as possible to allow for optimum equipment placement.

The UPS will require a room with a floor area of approx. 6.3 square metres if the UPS is located at a different site to the CER. The UPS can be located in the CER within the requirement shown above. The floor may be concrete.

The ventilation system in the CER should keep the temperature below 29.0 degrees C and vent to the outside to eliminate gases that may escape during battery operation or charging.

4.1.5.3 Power Requirements

The power requirement for the MCCP console is two 110.0 VAC, 15.0 ampere, uninterruptible power circuits.

4.2 Facility Alarm Systems

4.2.1 Inmate Cell Call System

The ICCS is provided so that an occupant of a cell may request assistance from the control post. This is achieved by operating a call originating device (COD) mounted in the cell. The call is annunciated in the control post, the guard responds to the call and cancels the call by operating a call cancelling device (CCD) external to the cell and adjacent to the cell door.

4.2.1.1 Conduit Requirements

One (1) 15 mm conduit is required from each cell, the conduits from four cells are combined in a junction box in the pipe chase. Two or three of these junction boxes are linked together by 25 mm conduit. One (1) 38 mm conduit connects the group to the terminal equipment space (TES) where they are terminated.

One (1) 25 mm conduits are provided from the TES to the control post. These are shared by the electronics contractors with each contractor using at least one each.

The cables interconnecting the equipment in the TES to the CER are normally installed in a cable tray which runs throughout the institution.

4.2.1.2 Space Requirements

The equipment should normally occupy half the area of an one (1) 2.483 m rack in each TES.

4.2.1.3 Power Requirements

The power requirement for this system is a 110.0 VAC, 15.0 ampere circuit.

4.2.2 Fixed Point Security Alarm System

The FPSA system is provided so that an occupant of designated rooms may request assistance from the control post. This is achieved by operating a call originating device (COD) mounted on the wall or under a desk. The call is annunciated in the control post, the guard responds to the room.

4.2.2.1 **Conduit Requirements**

One (1) 15 mm conduit is required from each designed room, the conduits from these rooms may be combined in a junction box. Two or three of these junction boxes may be linked together. The link will be 25 mm conduit and one (1) conduit (38 mm) is then run to the CER where it is terminated under the computer flooring.

4.2.2.2 **Space Requirements**

The FPSA COD is mounted on a wall or under the desk in the designated room.

4.2.2.3 **Power Requirements**

The power requirement for this system is a 110.0 VAC, 15.0 ampere circuit.

4.2.3 **Personal Portable Alarm System**

The PPA system is used by CSC staff working in all areas of the institution to alert the central security post staff to serious incidents or potentially dangerous personal security or safety situations. The PPA system consists of a central controller, a central receiver and a number of portable wireless transmitting devices (transmitters) in belt worn leather cases. PPA alarms are sent to the security post when these small portable transmitters are activated by the staff member. Alarm identification, alarm time and cancellation may be recorded on a data logger.

4.2.3.1 **Conduit Requirements**

One (1) 15 mm conduit is required from the PPA receiver which is located in a central area of the institution to the MCCP where the PPA controller is located. This conduit will accommodate the twisted and alarm signal wires. One (1) 15 mm conduit is required between the PPA receiver and the antenna which is located on the roof, the side of a building or on an existing radio tower.

4.2.3.2 **Space Requirements**

The PPA receiver will be mounted in a rack or on the wall in a central location of the institution. The PPA controller will be mounted in the MCCP control or on a shelve in the CER.

4.2.3.3 **Power Requirements**

The power requirement for the PPA equipment in the MCCP is a 110 VAC, 15.0 ampere, uninterruptible power circuit.

4.2.4 Portable Alarm Location System

The PAL system operates in conjunction with the Personal Portable Alarm (PPA) system to locate an area where the PPA alarm is originating from. The PAL system consists of central monitoring equipment, a number of nodes and a number of wireless sensors distributed within an institution. PPA alarm locations can be determined and sent to the security post. Alarm identification, alarm time and cancellation are data logged.

4.2.4.1 Conduit Requirements

One (1) 15 mm conduit is required from each PAL node which is located throughout the institution to the CER where the PAL controller is located. This conduit will accommodate a co-axial cable for the alarm signal from each node.

4.2.4.2 Space Requirements

The PALS nodes and wireless sensors will be mounted in the ceilings throughout the institution. The PALS controller in the CER will require approximately three (3) feet of rack space.

4.2.4.3 Power Requirement

The power requirement for the PALS equipment in the CER is one 110 VAC, 15.0 ampere, uninterruptible power circuit.

4.3 Access Control & Supplementary Systems

4.3.1 Door Control & Corridor Monitoring System

This system provides room and corridor access by door control from a designated CP. The door control system is usually integrated with a CCTV system to allow staff to view the person(s) requesting access.

4.3.1.1 Conduit Requirements

Two (2) 15 mm conduits are required from under the CER floor or the TES to the room and corridor doors requiring controlled access. One conduit will accommodate the CCTV system for video and camera control purposes. The other conduit is required for the door access control system.

4.3.1.2 Space Requirements

The rack space requirement will usually consists of approximately two (2) feet of one (1) 2.483 m rack in the CER or TES and one rack in the MCCP control console or CP console.

4.3.1.3 **Power Requirements**

The power requirement for the door control and monitoring system is one 110.0 VAC, 15.0 ampere circuit.

4.3.2 **Closed Circuit Television System**

This system allows observations to be made in cells, corridors, exercise yards and other locations where there is a need. The system usually consists of several cameras mounted at these locations with monitors grouped together at a convenient point such as the control post or the MCCP.

4.3.2.1 **Conduit Requirements**

Two (2) 15 mm conduits are required to each camera location, one for signal wiring and the other for VAC power to the camera and housing. If the camera has pan/tilt/zoom facilities, one of the two conduits may have to be increased in size to 19 mm to accommodate possible control wiring.

4.3.2.2 **Space Requirements**

The only space requirement for this system is rack space in a console for the monitors and possibly a pan/tilt/zoom controller.

4.3.2.3 **Power Requirements**

The power requirement for the CCTV equipment is one 110.0 VAC, 15.0 ampere circuit.

4.3.3 **Supplementary Intrusion Detection System**

This system provides supplement outdoor intrusion detection from the MCCP. The SIDS monochrome CCD camera is usually mounted on a high tower or roof top to provide surveillance and assessment of designated area(s).

4.3.3.1 **Conduit Requirements**

Two (2) 15 mm conduits are required from under the CER floor to the outdoor camera location. One conduit will accommodate the CCTV system for video and camera control cables. The other conduit is required for the camera and enclosure VAC power.

4.3.3.2 **Space Requirements**

Rack space in the MCCP control console is required for the SIDS monitor and camera Pan/Tilt/Zoom controller. The size of the rack space will depend on the size of the monitor and controller.

4.3.3.3 **Power Requirements**

The power requirement for this system is a 110.0 VAC, 15.0 ampere supply.

4.3.4 **Voice Recording Equipment**

The Voice Recorder Equipment (VRE) records all conversations on the telephones, radios, PA and PIDS PA systems in the MCCP.

VRE wiring can be run under the computer flooring and conduit is not normally required.

4.3.4.1 **Space Requirements**

The VRE is self contained in its own moveable rack and requires a floor area of 650 mm square with an equal area in front and behind for operator and technician access. It can be mounted with its back against a wall if required, however this is not preferable.

4.3.4.2 **Power Requirements**

The power requirement for this system is a 110.0 VAC, 15.0 ampere supply.

4.3.5 **Video Recording Equipment**

The Video Cassette Recorders (VCR) record all video from the various CCTV cameras installed throughout the institution. VCR installed in the MCCP will record the PIDS video form the perimeter cameras. VCR install in Security CP throughout the institution will record the video from their particular areas of surveillance interest.

VCR wiring can be run under the computer flooring and conduit is not required.

4.3.5.1 **Space Requirements**

The VCRs are normally installed in moveable racks and requires a floor area of 650 mm square with an equal area in front and behind for operator and technician access. Due to limited space in some CP, the VCRs may be on shelves under the desks.

4.3.5.2 **Power Requirements**

The power requirement for this system is a 110.0 VAC, 15.0 ampere supply.

4.4 Communications Systems

4.4.1 Two Way Communications Radio

The two way radio system provides routine operational, maintenance as well as emergency response communications between control posts, guards and vehicles in and around the facility. Base station radios and Digital Interface Units are installed in standard EIA electronic equipment racks in the CER.

The MCCP base station radios are connected to a common antenna mounted on an external tower. In the repeater configuration, the base stations are connected via a series of filters to a common antenna. Rack mounted remote radio controllers are mounted in the MCCP console. Digital Interface Units (DIU) are used to configure the base station radios for digital communications

Base station radios located in security control posts and maintenance control centres are connected to their own local antennas.

4.4.1.1 Conduit Requirements

One (1) 19 mm conduit is required from the CER to the antenna tower. The conduit may terminate at the base of the tower, if the tower is mounted on the roof. In the case of a ground mounted tower the conduit will continue up the tower. The lower portion of the tower is protected by anti climb shields.

4.4.1.2 Space Requirements

Three base station radios with associated DIUs will use approximately half of a EIA standard 2.483 m equipment rack in the CER. If the radios are configured as repeaters and filters are used, another EIA standard 2.483 m rack will be required.

In the MCCP console, the remote controller will require 5¼ inches (3 U) of console cabinet space.

4.4.1.3 Power Requirements

The power requirement for this system is a 110.0 VAC, 15.0 ampere supply.

4.4.2 Public Address System

The PA system is designed to allow the entire institution to be addressed or limited areas to be addressed from various points throughout the institution.

4.4.2.1 **Conduit Requirements**

Loudspeakers are distributed throughout the institution in areas where they are required. They are mounted in 254 mm x 254 mm x 102 mm back boxes mounted in the walls or in the ceilings. The boxes are joined in series by 15 mm conduit for the first ten or so boxes and then by 19 mm conduit to the cable tray. Where two strings of speaker boxes combine into one the resultant conduit is usually 19 mm. A 25 mm conduit is used between a TES and its respective control post.

4.4.2.2 **Space Requirements**

The PA equipment requires approximately half of a 2.483 m rack in the CER or half of a 2.483 m rack in a TES.

4.4.2.3 **Power Requirements**

The power requirement is for a 110 VAC, 15.0 ampere supply in the CER or a 110 VAC, 15.0 ampere supply in a TES.

4.43 **Limited Call Intercom System (LCIS)**

The LCIS is designed to provide communications between the control posts and points such as beyond a barrier controlled by the post. The control post has a master station mounted in a console and the remote station is mounted in a back box in the wall.

4.4.3.1 **Conduit Requirements**

The remote station is mounted in a 102 mm x 102 mm x 65 mm back box placed 1500 mm from the floor. One (1) 15 mm conduit connects these points to the TES or the cable tray. One (1) 25 mm conduit is used between a TES and its respective control post.

4.4.3.2 **Space and Power Requirements**

The LCIS usually forms part of the PA. Refer to the PA section for space and power requirements.

4.4.4 **Restricted Visit Intercom System**

The purpose of the RVIS is to provide a means of two-way (full-duplex) voice communication between an inmate and visitor while denying physical exchange. Typically, by providing transparent partitioning between the inmate and visitor, physical access is denied while allowing visual contact between each half of a restricted visiting booth. Within each booth, telephone handset will allow voice communication between the two halves. The control post has a master station mounted in a console.

4.4.4.1 Conduit Requirements

One (1) 15 mm conduit is required from each booth to the Restricted Visit Control Post.

4.4.4.2 Space Requirements

The RVIS telephone handsets are securely mounted on the wall of the booths. The RVIS controller is mounted in the console in the Restricted Visit CP.

4.4.4.3 Power Requirements

The power requirement for this system is a 110.0 VAC, 15.0 ampere supply.

4.4.5 Entertainment Cable Television

The Entertainment Cable Television (ECTV) System distributes FM radio and television signals to each cell and various other points throughout the institution.

The signals are received off-air via an antenna array for local and satellite signals or from a cable company. A signal from a VCR can be introduced. All these signals are processed in the head-end equipment and then distributed via splitters and amplifiers distributed throughout the system.

4.4.5.1 Conduit Requirements

A conduit outlet is required in each cell and in various inmate and staff lounges. Groups of four cell block outlet boxes are connected to a junction box by 19 mm conduit. The junction boxes are linked in groups of two or three and then to the TES using 38 mm conduit.

All other locations utilize 19 mm conduit to their respective TES locations.

The cable distributing the signals to the TES from the head end location is installed in a cable tray which runs throughout the institution. One (1) 19 mm conduit is required between the head-end equipment rack and the antenna site.

4.4.5.2 Space Requirements

The head-end equipment will occupy a half of a 2.483 m rack in the equipment room closest to the antenna site. The remainder of the equipment consists of amplifiers and splitters and is accommodated in a 400 mm x 400 mm x 100 mm cabinet located in each of the pertinent TES. This cabinet can either be mounted on the wall or placed under the computer flooring.

4.4.5.3 Power Requirements

The power requirement for this system is a 110 VAC, 15.0 ampere supply.

4.5 Control Posts (CP) and Terminal Equipment Spaces (TES)

There are several control posts and TES's throughout the institution. They are usually paired and connected by banks of conduits to enable connection between the main equipment of the various systems and the control panels that are associated with them. The number of conduits provided is normally very generous and provides for any possible expansion or replacement of the systems.

4.5.1 Conduit Requirements

All the consoles in the control posts with computer flooring do not require conduits. Normally the TES and CP locations are connected by cable trays or at least one 50 mm conduit.

4.5.2 Space Requirements

In each TES accommodation is required for two 2.483 racks, one rack to house the cell call system and the other the PA and LCIS equipment.

4.5.3 Power Requirements

Two (2) 110.0 VAC, 15.0 ampere power circuits are required.

4.6 Installation Requirements

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

4.7 Documentation Requirements

All as-build drawings and documentation shall be in accordance with the ES/SOW-0101, Statement of Work.

5.0 QUALITY ASSURANCE

5.1 General

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

6.0 DELIVERY

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

APPENDIX A

SUMMARY OF SYSTEM CONDUIT REQUIREMENTS

System	Conduit Requirements
MDS	One 38 mm conduit from the CER to the area between the two perimeter fences.
FDS	One 38 mm conduit from the CER to the inner perimeter fence.
MICROWAVE	One 19 mm conduit from the closest local control module to the sallyport area.
PIDS CCTV	**Signal and Control**. Two 50 mm conduits from the CER to the perimeter camera towers in both directions with junction boxes at each of the towers. One 19 mm conduit from the junction box to the cameras on the tower. **VAC Power**. Two 50 mm conduits from the electrical distribution panel in the CER to the junction box on the perimeter. One 38 mm conduit around the perimeter providing power to each camera group.
PIDS PA	Two 25 mm conduits from the CER to the first group of speakers on the perimeter fence, one in each direction. One 25 mm conduit between speaker locations.
MCCP	Control and signal cables (no conduit required) under the computer flooring to the CER. VAC UPS power in 19 mm conduit from the CER.
ICCS	One 15 mm conduit from each cell to a junction box in the pipe chase. Junction boxes linked together by 25 mm conduit. One 38 mm conduit from the group junction box to the CP/TES. One 25 mm conduit from the TES to the CP.
FPSA	One 15 mm conduit from each designed room to a junction box. Junction boxes connected by 25 mm conduit. One 38 mm conduit from a main junction box to the CER.
PPA	One 15 mm conduit from the PPA receiver to the MCCP. One 15 mm conduit from the PPA receiver to the antenna.
PALS	One 15 mm conduit from each PALS node to the CER.
Door Control	Two 15 mm conduits (one for CCTV, one for power) from the CER or from the TES to the room and/or corridor doors requiring controlled access.

System	Conduit Requirements
Supp. CCTV	Two 15 mm conduits to each camera location, one for signal wiring and the other for AC power to the camera and housing. If the camera has pan/tilt/zoom facilities, one of the two conduits may have to be increased in size to 19 mm to accommodate additional control wiring.
SIDS	Two 15 mm conduits from the CER to the camera location. One conduit for video and camera control cables. The other conduit for the camera and enclosure VAC power.
MCCP/VRE	Cables under the computer flooring.
MCCP/VCR	Cables under the computer flooring.
Two-way Radio	One 19 mm conduit from the Base Station to the antenna location.
Interior PA	One 15 mm conduit between speaker locations. Combine speaker locations require one 19 mm conduit. One 25 mm conduit from the TES to the CP.
LCIS	One 15 mm conduit from remote stations to the TES or the cable tray.
RVIS	One 15 mm conduit from each booth to the RVIS CP.
ECTV	One 15 mm conduit to in each cell and various inmate lounges. Groups of cell outlet boxes are connected to a junction box by 19 mm conduit. One 38 mm conduit from junction boxes to the TES. One 19 mm conduit from the head-end equipment rack and the antenna site.
CER/TES	CER and various TES are linked by one 50 mm conduit.

APPENDIX B

SUMMARY OF SYSTEM SPACE REQUIREMENTS

System	Space Requirements
MDS	The MDS control equipment requires approximately 1.5 m of EIA standard equipment rack space in the CER.
FDS	The FDS control equipment requires approximately 1.5 m of EIA standard equipment rack space in the CER.
MICROWAVE	The microwave control equipment requires approximately 0.5 m of EIA standard equipment rack space in the CER.
PIDS CCTV	The video distribution and switching equipment require approximately 1.0 m of EIA standard equipment rack space in the CER. The PIDS CCTV equipment in the MCCP requires approximately 1.0 m of EIA standard console cabinet space. A separate standalone rack is required to housed five (5) time lapse VCRs in the MCCP.
PIDS PA	The PIDS PA equipment requires approximately 0.5 m of EIA standard equipment rack space in the CER.
MCCP	The MCCP console usually consists of six EIA standard console cabinets joined together to form the control console. The maintenance video display unit (VDU) and ancillary equipment require approximately 1.0 m of EIA standard equipment rack space in the MCCP. The time-lapse VCRs and printer require a low profile cabinet with sliding shelves in the MCCP.
ICCS	The ICCS control equipment requires approximately 1.5 m of EIA standard equipment rack space in the TES.
FPSA	The FPSA control equipment requires approximately 0.5 m of EIA standard equipment rack space in the CER.
PPA	The PPA receiver requires to be mounted on a shelve in a rack or on the wall in a central location of the institution. The PPA controller mounted on a shelve requires approximately 0.25 m of the rack space in the ancillary equipment rack space in the MCCP.

System	Space Requirements
PALS	The PALS nodes and wireless sensors will be mounted in the ceilings throughout the institution. The PALS controller requires approximately 1.0 m of EIA standard equipment rack space in the CER.
Door Control	The hall and door control equipment require approximately 1.0 m of EIA standard equipment rack space in the CER or TES. The operator control equipment requires approximately 0.25 m of rack space in the control console.
Suppl. CCTV	Video switchers, multiplexers, etc. require rack space in EIA standard equipment racks in the CER or TES. The space requirement will depend on the type and amount of video equipment being used. The space requirement in the control console for the monitors and the pan/tilt/zoom controller if applicable will depend on the type and amount of video equipment being used.
SIDS	The space requirement for the SIDS control equipment in the CER will depend on the type of equipment being used. Rack space in the control console is required for the monitors and a pan/tilt/zoom controller if applicable.
MCCP/VRE	The Voice Recording Equipment is usually self contained in its own moveable rack in the MCCP and requires a floor area of 650 mm square with an equal area in front and behind for operator and technician access.
MCCP/VCR	The Time Lapse Video Cassette Recorders are normally installed in moveable racks in the MCCP and require a floor area of 650 mm square with an equal area in front and behind for operator and technician access.
Two-way Radio	Three base station radios with associated DIUs require approximately 1.5 m of EIA standard equipment rack space in the CER. If the radios are configured as repeaters, another EIA standard equipment is required for the filters. In the MCCP console, the remote controller requires 5¼ inches (3 U) of console cabinet space.
Interior PA	The Public Address equipment requires approximately 1.5 m of EIA standard equipment rack space in the TES.

System	Space Requirements
LCIS	The Limited Call Intercom System usually forms part of the interior PA system.
RVIS	The Restricted Visit Intercom System controller is mounted in the console in the Restricted Visit CP.
ECTV	The Entertainment Cable TV system head-end equipment requires approximately 1.5 m of EIA standard equipment rack space close to the antenna site. Amplifiers and splitters will be accommodated in the EIA standard equipment racks in the TES or amplifiers and splitters can be a small cabinet mounted on the wall or placed under the computer flooring.
TES	Each TES requires two EIA standard equipment racks, one rack to house the inmate cell call system and ancillary equipment. The other rack will house the interior PA and LCIS equipment.

APPENDIX C

SUMMARY OF SYSTEM POWER REQUIREMENTS

System	Power Requirements
MDS	The power requirement for the MDS equipment in the CER is one 110.0 VAC, 15.0 ampere, uninterruptible power circuit.
FDS	The power requirement for the FDS equipment in the CER is a 110.0 VAC, 15.0 ampere, uninterruptible power circuit.
MICROWAVE	The power requirement for the microwave equipment in the CER is a 110.0 VAC, 15.0 ampere, uninterruptible power circuit.
PIDS CCTV	The power required in the CER for video switching and control equipment is one 110.0 VAC, 15.0 ampere uninterruptible power circuit. The power requirement for the perimeter cameras is a 110.0 VAC, 20 ampere circuit to each group of usually four (4) cameras from the power distribution panel in the CER.
PIDS PA	The power requirement for the PIDS PA equipment in the CER is a 110.0 VAC, 15.0 ampere, uninterruptible power circuit.
MCCP	The power requirement for the MCCP console is two 110.0 VAC, 15.0 ampere, uninterruptible power circuits.
ICCS	The power requirement for the Inmate Cell Call System equipment in the security Control Post is a 110.0 VAC, 15.0 ampere circuit.
FPSA	The power requirement for the Fixed Point Security Alarm system equipment in the CER is a 110.0 VAC, 15.0 ampere circuit.
PPA	The power requirement for the Personal Portable Alarm system equipment in the MCCP is a 110.0 VAC, 15.0 ampere circuit.
PALS	The power requirement for the Portable Alarm Location System equipment in the CER is a 110.0 VAC, 15.0 ampere circuit.
Door Control	The power requirement for the Hall, Corridor and Door Monitor and Control system in the security Control Post is a 110.0 VAC, 15.0 ampere circuit.
Suppl. CCTV	The power requirement for the Supplementary CCTV system equipment in the security Control Post is a 110.0 VAC, 15.0 ampere circuit.
SIDS	The power requirement for the Supplementary Intrusion Detection System equipment in the CER is a 110.0 VAC, 15.0 ampere circuit.

System	Power Requirements
MCCP/VRE	The power requirement for the Voice Recording Equipment in the MCCP is a 110.0 VAC, 15.0 ampere circuit.
MCCP/VCR	The power requirement for the Video Cassette Recorder equipment in the MCCP is a 110.0 VAC, 15.0 ampere circuit.
Two-way Radio	The power requirement for the Radio Communications system equipment is a 110.0 VAC, 15.0 ampere circuit.
Interior PA	The power requirement for the Interior Public Address system equipment in the security Control Post is a 110.0 VAC, 15.0 ampere circuit.
LCIS	The Limited Call Intercom System is usually part of the Interior PA system. If a standalone LCIS installed, the power requirement for this system is a 110.0 VAC, 15.0 ampere circuit.
RVIS	The power requirement for the Restricted Visits Intercom System equipment in the RV Control Post a 110.0 VAC, 15.0 ampere circuit.
ECTV	The power requirement for the Entertainment Cable TV system equipment is a 110.0 VAC, 15.0 ampere circuit.
TES	The power requirement for the Terminal Equipment Space room is two 110.0 VAC, 15.0 ampere circuits.