

Correctional Service Canada
Technical Services Branch
Electronics Systems

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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

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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.
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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
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- 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.
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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.