
Gaming Policy and Enforcement Branch (GPEB)

TGS1
**Technical Gaming Standards for
Electronic Gaming Devices (EGDs)
in Gaming Venues**

Technical Standards Document (TSD) Version 1.3



**BRITISH
COLUMBIA**

**Ministry of Public Safety
and Solicitor General**
Gaming Policy and Enforcement Branch

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1 Overview of TSD

1.1 Introduction

1.1.1 General Statements I

The General Statements are as follows:

- a) Before being permitted to operate in the live environment, all Electronic Gaming Devices (EGDs) used in the Province of British Columbia must be tested to the applicable requirements set forth in this Technical Standards Document (TSD).
- b) The British Columbia Lottery Corporation (BCLC) may select an appropriate Accredited Testing Facility (ATF), or other equivalent body, to perform this testing; however, BCLC's selection requires approval from the Gaming Policy and Enforcement Branch (GPEB).
- c) The appointed testing body must provide their evaluation results to BCLC, who in turn must provide these evaluation results to GPEB for review, and where required, subsequent discussion.
- d) Although the appointed testing body may recommend the approval of any EGDs for use in the Province of British Columbia, the ultimate authority to approve EGDs rests solely with GPEB. Only GPEB can issue a Certificate of Technical Integrity under **Section 75 of the Gaming Control Act of British Columbia**.

Note: An "Electronic Gaming Device (EGD)" does NOT include, for purposes of this TSD, ancillary electronic equipment used in the conduct of Table Games.

1.1.2 General Statement II

It is the policy of GPEB, in consultation with BCLC, to update this TSD at minimum once annually, to reflect any changes in technology, testing methods, or known cheating methods.

Note: GPEB reserves the right to modify (or selectively apply) the requirements set forth in this TSD as deemed necessary to ensure the integrity of gaming in the Province of British Columbia.

1.2 Acknowledgment of Other TSDs Reviewed

1.2.1 General Statement

This TSD has been developed by reviewing and using portions of the Gaming Laboratories International (GLI) TSD named 'GLI-11'.

1.3 Purpose of TSD

1.3.1 Purpose

The Purpose of this TSD is as follows:

- a) To eliminate subjective criteria in analyzing and certifying EGD operation.
- b) To test those criteria that impact the credibility and integrity of EGD operation from both the Revenue Collection and Player's play point of view.
- c) To create a TSD that will ensure that EGDs in gaming venues are fair, secure, auditable, and able to operate correctly.
- d) To recognize that non-gaming testing (such as Electrical Testing) should not be incorporated into this TSD but left to appropriate test laboratories that specialize in that type of testing.
- e) To recognize that except where specifically identified in this TSD, testing is not directed at health or safety matters. These matters are the responsibility of the manufacturer of the equipment.
- f) To construct a TSD that can be easily changed or modified to allow for new technology.

- g) To construct a TSD that does not specify any particular method or technology (e.g.: choice of algorithm for random number generation). The intent is instead to allow a wide range of methods and technologies to be used to comply with this TSD, while at the same time, to encourage new methods and technologies to be developed.

1.3.2 No Limitation of Technology

One should be cautioned that this TSD should not be read in such a way that limits the use of future technology. The TSD should not be interpreted that if the technology is not mentioned, then it is not allowed. As new technology is developed, GPEB, in consultation with BCLC, will review this TSD, make any changes deemed necessary, and incorporate new minimum standards for the new technology.

Note: Although BCLC may recommend that particular changes be made to this TSD, the ultimate authority to approve changes rests solely with GPEB.

1.4 Other TSDs That May Apply

1.4.1 Other TSDs

This TSD covers the actual requirements for single player EGDs in gaming venues. The following other TSDs and documents may also apply:

- a) TGS2 – Technical Gaming Standards for Progressive Gaming Devices in Gaming Venues;
- b) TGS3 – Technical Gaming Standards for On-line Monitoring and Control Systems (MCSs) and Validation Systems in Gaming Venues;
- c) TGS4 – Technical Gaming Standards for Electronic Bingo Systems in Gaming Venues;
- d) The Criminal Code of Canada; and
- e) The Gaming Control Act of British Columbia.

2 Submission Requirements

2.1 Introduction

2.1.1 General Statement

This section shall govern the types of information that are, or may be required to be submitted by the submitting party in order to have equipment tested to this TSD. Where the information has not been submitted or is not otherwise in the possession of BCLC (together with GPEB) and/or the ATF, the submitting party shall be asked to supply additional information. Failure to supply the information can result in denial in whole or in part of the submission and/or lead to testing delays.

2.1.2 Previous Submission

Where BCLC (together with GPEB) and/or the ATF has been previously supplied with the information on a previous submission, duplicate documentation is NOT required, provided that the previous information is referred to by the submitting party, and those documents are easily located at BCLC's facilities, GPEB's facilities and/or the ATF's facilities. Every effort shall be made to reduce the redundancy of submission information.

Note: This TSD does not address submission requirements information for other gaming components, such as On-Line Monitoring and Control Systems (MCSs) and their components, or linked progressive controllers.

2.2 Prototype (Full Submission) Submissions

2.2.1 General Statement

A Prototype (full submission) submission is a first time submission of a particular piece of

hardware or software that has not previously been reviewed by BCLC (together with GPEB) and/or the ATF. For Modifications of previous submissions, including required changes to a previously submitted Prototype (full submission) certification, whether certified or pending certification, see "Submitting Modification Submissions" below.

Note: The testing of the submission may take place in the BCLC testing facilities, or at the ATF's facilities, or both, at the discretion of GPEB (in consultation with BCLC).

2.2.2 Submission Letter

Each submission shall include a request letter, on company letterhead, dated within one (1) week of the date the submission is received by BCLC (together with GPEB) or the ATF. The letter should include the following:

- a) A formal request for certification specifying British Columbia as the jurisdiction for which the device will be approved; and
- b) The items requested for certification. In the case of software, the submitting party shall include Identification (ID) numbers and revision levels, if applicable. In the case of hardware, the submitting party shall indicate the manufacturer, supplier, and model number of the associated components of hardware; and
- c) A contact person who will serve as the main point of contact for engineering questions raised during evaluation of the submission. This may be either the person who signed the letter or another specified contact.

2.2.3 Random Number Generator Submission

In some cases, the Random Number Generator (RNG) shall be submitted with the prototype (full submission) request. RNGs shall be submitted for certification where:

- a. The RNG code has changed or the implementation of the RNG has changed; or
- b. Where a previously certified RNG is being implemented on a new hardware platform (i.e. change of microprocessor); or
- c. Where a previously certified RNG is generating numbers that are outside the range of numbers previously tested; or
- d. The RNG has never been certified before under this TSD. In this case, the RNG must be certified as a part of the overall submission.

2.3 Hardware Requirements for RNG Testing

2.3.1 Hardware Requirements

The manufacturer shall submit the EGD with all boards and associated hardware for testing.

2.3.2 Cable Requirements

The manufacturer shall submit a cable to connect from the EGD to a Personal Computer (PC)-based computer. This cable will utilize serial type communications and easily attach to a standard PC. If any special attachments or converters are necessary, the submitting party shall supply the equipment.

2.3.3 Specifications for RNG Testing

RNG testing shall be conducted using methodologies that are 1) generally-accepted in the gaming industry, and 2) found to be acceptable to BCLC. These methodologies will also require approval from GPEB.

2.3.4 Additional Requirements

- a) Any test program RNG shall be identical to the RNG contained in the game software except for approved changes implemented to speed up the RNG process. GPEB, BCLC and/or the ATF may not allow any of the following changes where it determines such change might affect the data generated by the RNG. It should be noted that production software may have a test mode that contains this imbedded RNG test mode, provided

- that the machine indicates clearly that it is in said test mode;
- b) The RNG test program should NOT require credits on the machine in order to play;
 - c) The RNG test program should NOT award credits and NOT lock up for award pays;
 - d) The RNG test program does not have to show the game play. The program can just display a message that states RNG test in progress;
 - e) The manufacturer shall supply BCLC and/or the ATF with detailed instructions on how to set-up the EGD for test; and
 - f) The manufacturer shall supply BCLC and/or the ATF with a detailed description of the RNG algorithm that includes a detailed description on the RNG implementation in their device, including how the initial SEED is generated. In addition, it shall provide the algorithm for reseeding or changing of the seed during game play, if applicable.

2.4 Machine or Hardware Submission Requirements – Prototype (Full Submission) Certification

2.4.1 Presentation of Equipment to BCLC and/or the ATF; Identical Equipment

Each item of electronic gaming equipment supplied by a manufacturer to the field shall be functionally identical to the specimen tested and certified. For example, an EGD supplied as a certified device shall not have different internal wiring, components, firmware, circuit boards, circuit board track cuts or circuit board patch wires from the certified specimen, unless that change is also certified, see also **Section 2.8 Submissions of Modifications (Partial Submissions) to a Previously Certified Item**.

2.4.2 Accompanying Documentation

All accompanying technical documents, manuals and schematics shall be submitted. In addition, the following items shall be provided:

- a) If applicable, all UL, CSA, etc. or equivalent certification, see also **Section 3.3 Machine and Player Safety**. This certification information may be supplied at a later date;
- b) Any other equipment that may be used in the field in conjunction with the Submission;
- c) Accompanying software, see also **Section 2.5 Software Submission Requirements – Prototype (Full Submission) Certification**;
- d) If the submitting party has specialized equipment which is needed to test the submitted device, then the specialized equipment and all appropriate operation manuals for the equipment shall be included with the submission; and
- e) If requested, extension cables for door photo-optic detectors and any other hardware should be provided, so that the machine may be tested with doors opened. In addition, where a processor board is oriented in a machine in such a way that it would be difficult to install a plug and cable from an emulator, extension cables should be provided to allow the board to be re-located. The use of such extension cables shall not adversely affect the machine's operation.

2.5 Software Submission Requirements – Prototype (Full Submission) Certification

2.5.1 General Statement

Each submission of software shall contain the following:

- a) Two sets of all Erasable Programmable Read Only Memory (EPROM) devices, Compact Disk Read Only Memory (CD-ROM) devices, or other storage media which contain identical contents. This includes all video, sound, printer, touchscreen, bill acceptor, Random Access Memory (RAM) Clear, and game software. Where BCLC or the ATF already has tested a software component, resubmission may not be necessary (pending approval by GPEB);
- b) Percentage Return to Player (%RTP) calculation sheets;
- c) A written Statement of Verification that a previously certified RNG is used within the submitted software;

- d) A legible, color copy of the Payglass (if applicable);
- e) Source Code, a Link Map and Symbol Table. In addition, if requested, explanation of all non-volatile RAM on the device with the non-volatile RAM locations described (Note: The source code may be reviewed, compiled and studied, either at BCLC's facility and/or the ATF's facility);
- f) A manual explaining all diagnostic tests, meters, game configurations, error conditions and how to clear them;
- g) RAM Clear procedures;
- h) A general overview of the system, describing how the software and hardware are integrated, if required;
- i) Program block diagrams and flow charts for the game program, if required; and
- j) For all software involved in control of gaming functions, provide an assembler, linker, formatter, or other computing utilities as is necessary to generate the installed gaming software from the source code supplied. This requirement may be waived where program code is written in assembler and the listing file (showing the assembled and link code) is provided. If a non-PC-based platform development system is used, the manufacturer shall supply BCLC and/or the ATF with the necessary computer equipment and software necessary to compile and verify the final executable program.

Note: In some cases, BCLC and/or the ATF may have the wording on the payglass or game graphics translated to the English language or have the manufacturer supply an independent translator.

2.6 Software Programming Requirements and Compilation

2.6.1 General Statement

The following items shall appear in all source code or related modules:

- a) Module Name;
- b) Brief description of module function; and
- c) Edit History, including who modified it, when and why.

2.6.2 Source Code Commented

All source code submitted shall be commented in an informative and useful manner.

2.6.3 Source Code Completeness

All source code submitted shall be correct, complete and able to be compiled. The result of the compiled object code shall be identical to that in the storage medium submitted for evaluation.

Note: The addition of 'Date' and 'Time' stamps may cause additional differences in a compiled version. It is the manufacturers' responsibility to provide BCLC and/or the ATF with a method to compensate for, or resolve these differences.

2.7 Program Storage Medium Identification

2.7.1 General Statement

On the program medium that is submitted and subsequently placed in the field, each program shall be uniquely identified, displaying:

- a) Program ID number;
- b) Manufacturer;
- c) Version number;
- d) Type and size of medium (unless located on the medium as purchased unused from the supplier); and
- e) Location of installation in EGD, if potentially confusing.

Note: For EPROM based games, the identification label shall be placed over the UV window to

avoid erasing or alterations of the program.

2.8 Submissions of Modifications (Partial Submissions) to a Previously Certified Item

2.8.1 General Statement

For any update submission (e.g., a revision to an existing hardware or software that is currently under review, certified or has been reviewed and not certified), the following information shall be required to process the submission in addition to the requirements set forth in **Section 2.2.2 Submission Letter, Sub-Section a)**. This process is intended to speed the administrative burden of modification submissions. All modifications will require review and re-testing to verify compliance with the applicable requirements set forth in this TSD, as per **Section 1.1.1 General Statements I**.

2.8.2 Modification of Hardware

Each hardware submission shall:

- a) Identify the individual items being submitted (including part number);
- b) Supply a complete set of schematics, diagrams, data sheets, etc. describing the modification along with the reason for the change(s); and
- c) Provide the updated or new device, a description and the method of connection to the original EGD or hardware.

2.8.3 Modification of Main Software Functions or to Correct Software Error

The submitter should use the same requirements as in **Section 2.5 Software Submission Requirements – Prototype (Full Submission) Certification** listed above, except where the documentation has not changed. In this case, a resubmission of identical documents is not required. (e.g., if the payable and mathematics of the game are not changed, the submitting party may refer to previous documentation). However, the submission must include a description of the software change(s), modules affected and new source code for the entire program. Source code is required for the entire program to check compile and source code integrity.

2.8.4 Software Submission - Modification to Create New Game Personality

For a game specific submission (e.g., a new game or a new game personality), the following information may be required to process the submission:

- a) A complete description of the game, including documents that individually or collectively indicate the following:
 - i. For Reel Games:
 - A. The number of reels;
 - B. The number of lines and description of each line;
 - C. The maximum credits per line;
 - D. All payglances which show any game rules or payable information;
 - E. A list of each winning combination along with the pay amount and hits for each prize;
 - F. A listing of the logical reel strips, indicating the exact symbols' sequence, if applicable;
 - G. A listing of the physical reel strips, and the method of implementation used to obtain the virtual reel strips, if applicable;
 - H. A summary of each symbols frequency, if applicable;
 - I. A table to cross-reference each symbol type against the abbreviation, if abbreviations are used;
 - J. For games that use technologies other than physical mapping or virtual reel mapping, a detailed description of the relationship and steps between the time the RNG value is determined and the symbol is selected and the relative odds of each symbol being selected via the method;

- K. The denomination; and
- L. The minimum and maximum bet.
- ii. For Blackjack Games:
 - A. Dealer rules;
 - B. Double-down rules;
 - C. Pair-splitting rules.
 - D. Insurance/surrender rules;
 - E. Existence of any side bets;
 - F. The denomination; and
 - G. The minimum and maximum bet.
- iii. Poker Games:
 - A. Poker style (e.g., Draw, Stud, etc.);
 - B. Special rules (e.g., Wild Cards, etc.);
 - C. Auto holding;
 - D. Existence of any side bets;
 - E. Any mathematical work indicating the payback return when using optimum play strategy, if applicable;
 - F. The denomination; and
 - G. The minimum and maximum bet.
- iv. Keno/Bingo Games:
 - A. Number of balls/spots that can be selected;
 - B. Number of balls drawn;
 - C. Special rules (e.g., Wild Cards, etc.);
 - D. The denomination; and
 - E. The minimum and maximum bet.
- v. Craps Games:
 - A. Odds for each spot;
 - B. Number of player stations utilized with the game;
 - C. Time frame (if any) for betting; and
 - D. The minimum and maximum bet.
- vi. Roulette Games:
 - A. Number of spots (use of '00' or not);
 - B. Number of player stations utilized with the game;
 - C. Time frame (if any) for betting; and
 - D. The minimum and maximum bet.

2.9 Calculation Sheets

2.9.1 General Statement

For each game submitted, the manufacturer shall supply the calculation sheets that determine the theoretical %RTP (including the base game, double-up options, free games, bonus features, etc.).

2.10 Player Options

2.10.1 General Statement

Where different player options (e.g., number of credits bet) vary the payable, a separate calculation for each option is required.

2.11 Player Strategy

2.11.1 General Statement

Where a game requires or allows use of a player strategy that can affect the outcome of the game and the continuing actual %RTP, the manufacturer shall list the assumed player strategy used in the theoretical calculations of the %RTP and the source of said strategy. If the

manufacturer fails to provide this information, BCLC and/or the ATF will calculate the outcome prior to approval by GPEB.

2.11.2 Field Results

For games with player strategy, if available, actual game return statistics from development laboratories or field trials of the game in other jurisdictions shall be submitted.

2.12 Joint Venture Submissions

2.12.1 General Statement

A system is considered a joint venture when two or more companies are involved in the manufacturing of one system. Due to the increasing amount of joint venture submissions (more than one supplier involved in a product submission) and to alleviate any confusion to the suppliers, the following procedures must be followed for such submissions (pending approval by GPEB).

- a) One company will prepare and submit the entire submission, even if they are using parts from other suppliers, and must identify all part numbers of all components. This will be the primary contact for the submission.
- b) The company submitting an approval request should do so on their letterhead. BCLC and/or the ATF will delegate an internal file number in this company's name and may bill this company for all costs incurred throughout the evaluation and approval process.
- c) The primary contact will be called when questions arise. However, BCLC will work with all parties involved, completing the review.
- d) All suppliers who are part of the submission "group" may need to be registered in British Columbia.
- e) Upon completion, it is the primary contact company that will receive the approval letter, provided the submission meets the requirements set out in this TSD as well as those requirements set out in any other applicable TSD. The primary contact company may then release copies of the approval letter to the associated manufacturer(s).

3 Machine Requirements – Hardware

3.1 Introduction

An EGD at a minimum will contain embodiment of randomness in determination of prizes, contain some form of activation to initiate the selection process, and contain a methodology for delivery of the determined outcome. The EGD may be separated in parts, where some may be within or outside the player terminal (e.g., EGDs that function with a system).

3.2 Physical Security

3.2.1 General Statement

An EGD shall be robust enough to withstand forced illegal entry which would not leave behind evidence of the attempted entry, unless such entry causes an error code or is cleared at the commencement of a new play, and which does not affect the subsequent play or any other play, prize or aspect of the game.

3.3 Machine and Player Safety

3.3.1 General Statement

Electrical and mechanical parts and design principals of the EGD may not subject a player to any physical hazards. BCLC and the ATF shall NOT be responsible for Safety and EMC testing, as it is the responsibility of the manufacturer of the goods to obtain the appropriate Underwriters Laboratory (UL) / Canadian Standards Association (CSA) certification. Such Safety and EMC testing is required under Provincial and Municipal regulations and should be researched

accordingly by those parties who manufacture said devices. BCLC and the ATF shall not be responsible for, nor be liable for, these matters.

3.4 Environmental Effects on Game Integrity

3.4.1 Game Integrity Standard

BCLC and/or the ATF will perform certain tests to determine whether or not outside influences affect game fairness to the player or create cheating opportunities. An EGD shall be able to withstand the following tests, resuming game play without operator intervention:

- a) RNG. The RNG and the overall random selection process shall be impervious to influences from outside the device, including, but not limited to, electro-magnetic interference, electro-static interference, and radio frequency interference;
- b) Electro-Magnetic Interference. EGDs shall not create electronic noise that affects the integrity or fairness of neighbouring machines or associated equipment;
- c) Electro-Static Interference. Protection against static discharges requires that the machine's conductive cabinets be earthed in such a way that static discharge energy shall not damage, or inhibit the normal operation of the electronics or other components within the EGD. EGDs may exhibit temporary disruption when subjected to a significant electro-static discharge greater than human body discharge, but they shall exhibit a capacity to recover and complete any interrupted play without loss or corruption of any control or data information associated with the EGD. The tests will be conducted with a severity level of a minimum of 27KV air discharge;
- d) Radio Frequency Interference (RFI). EGDs shall not divert from normal operation by the application of RFI at a frequency range from twenty-seven (27) to one thousand (1000) MHZ with a field strength of three (3) volts per meter;
- e) Magnetic Interference. EGDs shall not be adversely affected by magnetic interference. The manufacturer should supply any documentation if the device has had magnetic interference testing against any recognized standard; and
- f) Liquid Spills. Liquid spills applied to the outside of an EGD shall not affect the normal operation of the machine, the integrity of the material or information stored inside the cabinet, or the safety of the players operating the equipment. If liquids are spilled into a coin acceptor or bill acceptor, the only degradation permitted is for the acceptor to reject all inputs or generate an error condition, see also **Section 4.13 Error Conditions**.

3.5 Hardware Requirements-Other

3.5.1 General Statement

Each EGD shall meet the following hardware requirements:

- a) Microprocessor Controlled. Be controlled by one (1) or more microprocessors or the equivalent in such a manner that the game outcome is completely controlled by the microprocessor or a mechanical device, as approved in **Section 4.3 Mechanical and Electro-Mechanical RNG Requirements**;
- b) On/Off Switch. An on/off switch that controls the electrical current shall be located in a place which is readily accessible within the interior of the machine so that power cannot be disconnected from outside of the machine using the on/off switch. The on/off positions of the switch shall be labelled; and
- c) Temperature and Humidity. EGDs can be expected to operate in a variety of extreme environments. In the event that the designed operational parameters of an EGD are exceeded, the machine, if incapable of continued proper operation, shall perform an orderly shutdown without loss of game status, accounting, and security event data. The manufacturer should supply any documentation if the device has had temperature and humidity testing against any recognized standard.

3.6 Cabinet Wiring

3.6.1 General Statement

The EGD shall be designed so that power and data cables into and out of the EGD can be routed so that they are not accessible to the general public. This is for game integrity reasons only, not for health and safety. Security-related wires and cables that are routed into a logic area shall not be able to be easily removed.

3.7 Machine Identification

3.7.1 General Statement

An EGD shall have a not easily removable, without leaving evidence of tampering, identification badge, permanently affixed to the exterior of the cabinet by the manufacturer, and this badge shall include the following information:

- a) The manufacturer;
- b) A unique serial number;
- c) The EGD model number; and
- d) The date of manufacture.

3.8 Tower Light

3.8.1 General Statement

The EGD shall have a light located conspicuously on top of the EGD that automatically illuminates when a player has won an amount or is redeeming credits that the machine cannot automatically pay, an error condition has occurred (including 'Door Open'), or a 'Call Attendant' condition has been initiated by the player. This requirement may be substituted for an audible alarm for machines such as the 'bar-top' style.

3.9 Manipulation of Power Supply

3.9.1 Surges

The machine shall not be adversely affected, other than resets, by surges or dips of $\pm 20\%$ of the supply voltage.

Note: It is acceptable for the equipment to reset provided no damage to the equipment or loss or corruption of data is experienced in the field.

3.10 Diverter and Drop Box Requirements

3.10.1 Diverter

For games that accept coins or tokens, the software shall ensure that the diverter directs coins to the hopper or to the drop box when the hopper is full. The hopper full detector shall be monitored to determine whether a change in diverter status is required. If the state of the detector changes, the diverter shall operate as soon as possible, or within ten (10) games, after the state change, without causing a disruption of coin flow, or creating a coin jam. Hopper-less EGDs shall always divert coins to the drop box.

3.10.2 Drop Box

If the game is equipped to accept coins or tokens, then the following rules shall be met:

- a) Each EGD equipped to accept coins or tokens shall contain a separate slot drop bucket or slot drop box to collect and retain all such slot coins or tokens that are diverted into the drop box;
- b) A slot drop bucket shall be housed in a locked compartment separate from any other compartment of the EGD; and
- c) There must be a method to monitor the drop box area, even if manufactured by a different company.

3.11 External Doors/Compartments Requirements

3.11.1 General Requirements

- a) The interior of the device should not be accessible when all doors are closed and locked;
- b) Doors shall be manufactured of materials that are suitable for allowing only legitimate access to the inside of the cabinet (i.e., doors and their associated hinges shall be capable of withstanding determined illegal efforts to gain access to the inside of the EGD and shall leave evidence of tampering if an illegal entry is made);
- c) The seal between the cabinet and the door of a locked area shall be designed to resist the entry of objects;
- d) There shall be a light on the top of the device that is clearly visible that automatically illuminates when the door to the EGD, or doors to any devices connected to the EGD which may affect the operation of the EGD, are opened. This requirement may be substituted for an audible alarm or a common candle for machines such as the 'bar-top' style;
- e) Bar-top Game Exception. All bar-top EGDs shall have a light alarm, or an audio door alarm, installed. The alarm shall be designed to activate when the inside of the machine is accessed, with power on;
- f) All external doors shall be locked and monitored by door access sensors, which shall detect and report all external door openings, both to the machine by the way of an error and to an on-line system (NOTE: the drop box door open does not have to cease game play; however, it must still illuminate the tower light or alarm and notify the on-line system);
- g) It shall not be possible to insert a device into the EGD that will disable a door open sensor when the machine's door is shut without leaving evidence of tampering;
- h) The sensor system shall register a door as being open when the door is moved from its fully closed and locked position.

3.12 The Logic Door and Logic Area

3.12.1 General Statement

The logic area is a locked cabinet area (with its own locked door), which houses electronic components that have the potential to significantly influence the operation of the EGD. There may be more than one (1) such logic area in an EGD.

3.12.2 Electronic Components

Electronic component items that are required to be housed in one (1) or more logic areas are:

- a) CPUs and other electronic components involved in the operation and calculation of game play (e.g., game controller electronics and components housing the game or system firmware program storage media);
- b) Electronics involved in the operation and calculation of game result determination;
- c) Electronics involved in the calculation of game display, and components housing display program storage medium (passive display equipment exempted);
- d) Communication controller electronics, and components housing the communication program storage media or, the communication board for the on-line system may reside outside the EGD; and
- e) All flash memory devices that affect the game play function of the EGD.

3.13 Coin and Currency Compartments

3.13.1 General Statement

The coin and currency compartments shall be locked separately from the main cabinet area, except that a separate cash compartment shall not be required for coins necessary to pay prizes in a machine that pays prizes through a drop hopper.

3.13.2 Access to Currency

- a) Access to currency storage area is to be secured via separate key locks and shall be

- fitted with sensors that indicate door open/close or stacker removed.
- b) Access to the currency storage area is to be through two (2) levels of locks (the relevant outer door plus one other door or lock) before the receptacle or currency can be removed.

3.14 Program Memory, RAM and Non-Volatile Devices Used to Store Program Memory

3.14.1 Non-Volatile RAM Requirements

The following are the requirements for RAM:

- a) Battery Back-up. A battery back-up, or an equivalent, shall be installed on the game for the electronic meters and shall be capable of maintaining the accuracy of all information required for thirty (30) days after power is discontinued from the machine. The back-up device shall be kept within the locked Logic Area;
- b) If the battery back-up is used as an 'off chip' battery source, it shall re-charge itself to its full potential in a maximum of twenty-four (24) hours. The shelf life shall be at least five (5) years;
- c) Random access memory that uses an off-chip back-up power source to retain its contents when the main's power is switched off shall have a detection system which will provide a method for software to interpret and act upon a low battery condition; and
- d) Clearing non-volatile memory shall only be able to be undertaken by accessing the logic area in which it is housed.

3.14.2 Function of RAM Reset

Following the initiation of a RAM reset procedure (utilizing a certified RAM Clear method); the game program shall execute a routine, which initializes each and every bit in RAM to the default state. For games that allow for partial RAM clears, the methodology in doing so must be accurate and the game must validate the un-cleared portions of RAM.

3.14.3 Default Reel Position or Game Display

The default reel position or game display after a RAM reset shall not be the top award on any selectable line. The default game display, upon entering game play mode, shall also not be the top award. This applies to the base game only and not any secondary bonus devices.

3.14.4 Configuration Setting

It shall not be possible to change a configuration setting that causes an obstruction to the electronic accounting meters without a RAM clear, see also, **Section 3.14.1, Sub-Section d)**. Notwithstanding, a change to the denomination must be done by a secure means, which includes access to the locked logic area. The monitoring of denomination changes will assist in preventing bill validator fraud.

3.14.5 Requirements for Program Storage Devices

All program storage devices, including Read Only Memory (ROM) devices, EPROMs, Flash ROMs, Digital Versatile Disks (DVDs), CD-ROM, and any other type of program storage devices shall be clearly marked with sufficient information to identify the software and revision level of the information stored in the devices.

3.15 Contents of Critical Memory

3.15.1 General Statement

Critical memory is used to store all data that is considered vital to the continued operation of the EGD. This includes, but is not limited to:

- a) All electronic meters required in **Section 4.10 Electronic Metering within the EGD** including last bill data and power up and door open metering;
- b) Current credits;

- c) EGD/game configuration data;
- d) Information pertaining to the last five (5) plays with the RNG outcome (including the current game, if incomplete); and
- e) Software state (the last normal state the EGD software was in before interruption).

3.16 Maintenance of Critical Memory

3.16.1 General Statement

Critical memory storage shall be maintained by a methodology that enables errors to be identified and corrected in most circumstances. This methodology may involve signatures, checksums, partial checksums, multiple copies, timestamps and/or effective use of validity codes.

3.16.2 Comprehensive Checks

Comprehensive checks of critical memory shall be made during each EGD restart (e.g., power up cycle). EGD control programs (software that operates the EGD's functions) shall test for possible corruption caused by failure of the program storage medium and all critical game functions. Test methodology shall detect 99.99 percent of all possible failures.

3.16.3 Control Program

The control program (software that operates the EGD's functions) shall allow for the EGD to ensure the integrity of all control program components during execution of said components.

3.16.4 Program Storage Devices (PSDs)

All Program Storage Devices (PSDs) in the executable address space of a main processor, shall be validated during the following conditions:

- a) Any power up;
- b) The first time the files are loaded for use (even if only partially loaded); and

3.16.5 RAM and PSD Space

RAM and PSD space that is not critical to machine security (e.g., video or sound ROM) are not required to be validated.

3.17 Unrecoverable Critical Memory

3.17.1 General Statement

An uncorrectable corruption of RAM shall result in a RAM error. The RAM should not be cleared automatically, but shall require a full RAM clear performed by an authorized person.

3.18 Write Once Read Many (WORM) Program Storage

3.18.1 General Statement

A WORM used as a program storage device shall only contain the program files that operate the game.

3.18.2 Utilizing Integrity Check

The control program shall utilize an integrity check, preferably a secured hashing method such as MD5 or SHA to authenticate that the program and/or support files have not been corrupted or altered prior to use/loading.

3.18.3 CD-ROM "Re-Writeable Disk"

In the case of a CD-ROM, a re-writeable disk may not be used.

3.18.4 CD-ROM "Session Closed"

In the case of a CD-ROM, "the Session" shall be closed to prevent any further writing.

3.18.5 Write Protection

In the case of a hard disk, a write-protected drive shall be used. SCSI Devices are preferred, as they provide a write protect jumper which can be sealed. Any other type drive will be required to have the write line cut and verified in the field, and any other means of write protection will be examined on a case-by-case basis.

3.18.6 Alternate Storage Medium

The program residing in the EGD shall be contained in a storage medium, which cannot be altered through use of the circuitry or programming of the EGD itself. If the program is contained in any other medium, the following rules shall be met:

- a) The EGD shall authenticate all critical game files including, but not limited to, executables, data, and operating system files and other files, which may affect the game outcome or operation, which reside on the medium. This authentication shall employ a hashing algorithm which produces a 'Message Digest' (the mathematical results/signature of the hashing algorithm) output of at least 128 bits (this value will constantly be re-evaluated, based on technology advancements and new security methods available) at minimum, as certified by BCLC and/or the ATF, and approved by GPEB;
- b) The Message Digest(s) for all files as defined in (a) shall reside on a memory device (ROM based or other medium) within the EGD. Message Digests which reside on any other medium shall be encrypted, using a public/private key algorithm with a minimum of a 512 bit key (this value will constantly be re-evaluated based on technology advancements and new security methods available), or an equivalent encryption algorithm with similar security certified by BCLC and/or the ATF, and approved by GPEB
- c) The EGD shall authenticate all critical files against the stored Message Digest(s). This authentication shall meet the requirements of 3.16.4 Program Storage Devices (PSDs) (Note: Critical files are those files which affect game play, operation, or outcome);
- d) In the event of a failed authentication, after the game has been powered up, the EGD should immediately enter an error condition with the appropriate tower light signal, and record the details, including time and date of the error in a log. This error shall require operator intervention. The game shall display specific error information and shall not clear until either the file authenticates properly, following the operator intervention, or the medium is replaced or corrected, and the device's memory is cleared, the game is restarted, and all files authenticate correctly; and
- e) The device shall be capable of displaying the 'Message Digest' of any and all files on demand through the audit mode, see also **Section 4.10.6 Software Meter Information Access**.

3.19 Flash Memory Devices

3.19.1 General Statement

Flash memory devices that contain the control program are allowed as long as the ability to 're-write' or 'flash' the device, while installed in the logic board, is physically disabled (i.e., write line cut on the logic board). Each use of flash memory devices will be assessed.

Note: Use of any hardware switch to enable the Write Line will be reviewed on a case-by-case basis.

3.20 Multi-Station Games

3.20.1 General Statement

A Multi-Station game is an EGD that incorporates more than one (1) player terminal, and only has one (1) RNG, which is controlled by the master terminal. The master terminal, containing the games CPU, will house the game display, which is shared among the player terminals. Each station must meet the requirements outlined throughout this TSD, including machine identification

and metering.

Note: There must be a method for each player to know when the next game will begin.

3.21 Printed Circuit Board (PCB)

3.21.1 PCB Identification Requirements

Requirements for PCB identification:

- a) Each Printed Circuit Board (PCB) shall be identifiable by some sort of name (or number) and revision level;
- b) The top assembly revision level of the PCB shall be identifiable (if track cuts and/or patch wires are added to the PCB, then a new revision number or level shall be assigned to the assembly); and
- c) Manufacturers shall ensure that circuit board assemblies used in their EGDs conform functionally to the documentation and the certified versions of those PCBs that were evaluated by BCLC and/or the ATF, and approved by GPEB.

3.22 Patch Wires

3.22.1 Documentation of Patch Wires & Track Cuts

All patch wires and track cuts shall be documented, in an appropriate manner, in the relevant service manual and/or service bulletin and shall be submitted to BCLC or the ATF. This does not prohibit required repairs in the field.

3.23 Switches and Jumpers

3.23.1 General Statement

If the game contains 'Switches and Jumpers,' the following rules shall be met:

- a) All switches or jumpers shall be fully documented for evaluation by BCLC and/or the ATF;
- b) Hardware switches which may alter the paytables, game denomination, or payout percentages in the operation of the EGD must meet the requirements set forth in **Section 3.14.4 Configuration Setting** of this TSD and must be housed within a logic compartment of the EGD. This includes top award changes (including progressives), selectable Blackjack settings, or any other option that would affect the %RTP whether or not that %RTP is within legal limits.

3.24 Mechanical Devices Used for Displaying of Game Outcomes

3.24.1 General Statement

If the game has mechanical or electro-mechanical devices, which are used for displaying game outcomes, the following rules shall be observed:

- a) Electro-mechanically controlled display devices (e.g. reels or wheels) shall have a sufficiently closed loop of control so as to enable the software to detect a malfunction, or an attempt to interfere with the correct operation of that device. This requirement is designed to ensure that if a reel or wheel is not in the position it is supposed to be in, an error condition will be generated;
- b) Mechanical assemblies (e.g., reels or wheels) shall have some mechanism that ensures the correct mounting of reels' artwork, if applicable;
- c) Displays shall be constructed in such a way that winning symbol combinations match up with pay lines or other indicators; and
- d) A mechanical assembly shall be so designed that it is not obstructed by any other components.

3.25 Video Monitors/Touch Screens

3.25.1 General Statement

All video games shall meet the following rules:

- a) Touch screens (if applicable) shall be accurate and, once calibrated, shall maintain that accuracy for at least the manufacturer's recommended maintenance period;
- b) A touch screen (if applicable) should be able to be re-calibrated by Venue staff without access to the machine cabinet other than opening the main door; and
- c) There shall be no hidden or undocumented buttons/touch points (if applicable) anywhere on the screen, except as provided for by the game rules that affect game play.

3.26 Coin or Token and Bill Acceptors and Other Methods of Inserting Value into the Machine

3.26.1 Coin or Token Acceptors

If the EGD uses a coin acceptor, the acceptor shall accept or reject a coin on the basis of metal composition, mass, composite makeup, or equivalent security. In addition, it shall meet the following rules:

- a) Coin Acceptor Security Features/Error Conditions. The coin acceptor shall be designed to prevent the use of cheating methods such as slugging (counterfeit coins), stringing (coin pullback), the insertion of foreign objects and other manipulation;
- b) Rapidly Fed Coins. The EGD shall be capable of handling rapidly-fed coins or piggy backed coins so that occurrences of cheating are eliminated;
- c) Direction Detectors. The EGDs shall have suitable detectors for determining the direction and the speed of coin travel in the receiver. If a coin traveling at too slow of a speed or improper direction is detected, the EGD shall enter an error condition and display an error condition for at least thirty (30) seconds or be cleared by an attendant;
- d) Invalid Coins. Coins deemed invalid by the acceptor shall be rejected to the coin tray and shall not be counted as credits;
- e) Coin Acceptance Conditions. Acceptance of coins for crediting to the credit meter shall only be possible when the EGD is enabled for play. Other states, such as error conditions, including door opens, audit mode and game play, shall cause the disabling of the coin acceptor system;
- f) Credit Meter Update on Coin Insertion. Each coin inserted shall register the actual monetary value or a number of credits on the player's credit meter for the current game or bet meter. If registered directly as credits, the conversion rate shall be clearly stated, or be easily ascertainable from the EGD.

Note: The error conditions within this section shall also comply with **Section 4.13 Error Conditions** unless otherwise noted.

3.26.2 Bill Acceptors

All acceptance devices shall be able to detect the entry of valid bills, tickets or other approved notes, if applicable, and provide a method to enable the EGD software to interpret and act appropriately upon a valid or invalid input. The acceptance device(s) shall be electronically-based and be configured to ensure that they only accept valid bills of legal tender. Bill acceptors may also accept tickets or other approved notes and reject all others in a highly accurate manner. The bill input system shall be constructed in a manner that protects against vandalism, abuse, or fraudulent activity. In addition, bill acceptance device(s) shall meet the following rules for all acceptable types of medium:

- a) Credits. Credits shall only be registered when:
 - i. The bill or other note has passed the point where it is accepted and stacked; and
 - ii. The acceptor has sent the "irrevocably stacked" message to the machine.

3.26.3 Communications

All bill acceptors shall communicate to the EGD using a bidirectional protocol.

3.26.4 Factory Set Bill Acceptors

If bill acceptors are designed to be factory set only, it shall not be possible to access or conduct maintenance or adjustments to those bill acceptors in the field, other than:

- a) The selection of bills, tickets or other approved notes and their limits;
- b) Changing of certified EPROMs or downloading of certified software;
- c) Adjustment of the tolerance level for accepting bills or notes of varying quality should not be allowed externally to the machine. Adjustments of the tolerance level should only be allowed with adequate levels of security in place. This can be accomplished through lock and key, physical switch settings, or other accepted methods approved on a case-by-case basis by GPEB;
- d) Maintenance, adjustment, and repair per approved factory procedures; or
- e) Options that set the direction or orientation of acceptance.

3.26.5 Tokenization

For games that allow tokenization, the game shall receive from the bill acceptor and post to the player the entire amount inserted.

3.27 Machine Metering of Bill Acceptor Events

3.27.1 General Statement

An EGD, which contains a bill acceptor device, shall maintain sufficient electronic metering to be able to report the following:

- a) Total monetary value of all items accepted;
- b) Total number of all items accepted; and
- c) A break down of the bills accepted:
 - i. For bills, the game shall report the number of bills accepted for each bill denomination;
 - ii. For all other notes, the game shall have a separate meter that reports the number of notes accepted, not including bills.

3.27.2 Bill Acceptor Recall

An EGD that uses a bill acceptor shall retain in its memory and display, at minimum, the denominations of the last ten (10) bills inserted.

3.28 Bill Acceptor Error Conditions

3.28.1 Error Conditions

Each EGD and/or bill acceptor shall have the capability of detecting and displaying (for bill acceptors, it is acceptable to disable or flash a light or lights) the following bill acceptor error conditions:

- a) Stacker Full – the bill acceptor should disable itself to accept no more bills. The game should not generate an error message when the stacker is full;
- b) Bill Jams – it is acceptable for the bill acceptor to indicate there is a bill jam by disabling itself to accept no more bills or by some other method;
- c) Bill Acceptor Door Open – where a bill acceptor door is the belly glass door, a door open signal is sufficient;
- d) Stacker Door Open or Stacker Removed.

Note: The Error Conditions listed above shall also comply with **Section 4.13 Error Conditions**.

3.28.2 Power Failure during Bill Acceptance/Validation

If a power failure occurs during acceptance, the bill acceptor shall give proper credits for the bill or return the bill to the player, notwithstanding that there may be a small window of time where power may fail and credit may not be given. In this case, the window shall be less than one (1) second.

3.28.3 Self Test

The bill acceptor device shall perform a self-test at each power up. In the event of a self-test failure, the bill acceptor shall automatically disable itself (i.e., enter bill reject state) until the error state has been cleared.

3.29 Bill Acceptor Requirements

3.29.1 Bill Acceptor Requirements

- a) A bill acceptor shall not be adversely affected by the following:
 - i. Electro-static discharge;
 - ii. Power surges;
 - iii. Radio frequency interference *;
 - iv. Electro-magnetic interference *; and
 - v. Environmental extremes *.
- b) Interconnecting cables from the bill acceptor device to the EGD shall not be exposed external to the EGD; and
- c) If liquids are spilled into a bill acceptor, the only degradation permitted is for the acceptor to reject all bill inputs or generate an error condition, see also **Section 4.13 Error Conditions**.

* The manufacturer should supply any documentation if the bill acceptor has had any of the above tests performed by a recognized standard.

3.30 Bill Acceptor Stacker Requirements

3.30.1 General Statement

Each bill acceptor shall have a secure stacker and all accepted bills shall be deposited into the secure stacker. The secure stacker is to be attached to the EGD in such a manner so that it cannot be easily removed by physical force and shall meet the following rules:

- a) The bill acceptor device shall have a 'stacker full' sensor;
- b) There shall be a separate key to access the stacker area. This key shall be separate from the main door. In addition, a separate key shall be required to remove the bills from the stacker; and
- c) A tower light shall be activated whenever there is access to the bill door or the stacker has been removed.

3.31 Credit Redemption

3.31.1 Credit Redemption

Available credits may be collected from the EGD by the player pressing the "COLLECT" button at any time other than during:

- a) A game being played;
- b) Audit mode;
- c) Any door open;
- d) Test mode;
- e) A Credit Meter or Win Meter incrimination, unless the entire amount is placed on the meters when the collect button is pressed; or
- f) An error condition.

3.31.2 Hopper/Credit Limits

If credits are collected, and the total credit value is greater than or equal to a specific limit (e.g., Hopper Limit for hopper games or Printer Limit for printer games), the game shall lock up until the credits have been paid, and the handpay is cleared by an attendant.

3.32 Hoppers

3.32.1 Hoppers & Hopper Error Conditions

There shall be under no circumstances, an abnormal payout from the hopper (if one exists) when the hopper is exposed to higher levels of electro-static discharge or if power is lost at any time during a payout. The hopper shall be interfaced in such a way as to allow the EGD control program to monitor the hopper mechanism, in all game states, to identify at least the following events and shall meet the rules in **Section 4.13 Error Conditions**:

- a) Extra coin paid; and
- b) Hopper jam or empty.

Note: The hopper shall be resistant to manipulation by the insertion of a light source or any foreign object.

3.33 Printers

3.33.1 Payment by Ticket Printers

If the EGD has a printer that is used to make payments, the EGD may pay the player by issuing a printed ticket. The printer shall print on a ticket and provide the data to an on-line data system that records the following information regarding each payout ticket printed. The information listed below can be obtained from the EGD, interface board, the on-line data management system, or another means:

- d) Value of credits in Canadian currency in numerical form;
- e) Time of day the ticket was printed in twenty-four (24) hour format showing hours and minutes – printing of this information is not required, provided that storage of this information is in the database;
- f) Date, in any recognized format, indicating the day, month, and year;
- g) EGD number or machine number; and
- h) Unique validation number or barcode.

Note: To meet this standard, the EGD shall either keep a duplicate copy or print only one (1) copy to the player but have the ability to retain the last thirty-five (35) ticket information to resolve player disputes. In addition, a BCLC and GPEB approved system shall be used to validate the payout ticket, and the ticket information on the Validation System shall be retained at least as long as the ticket is valid at that location.

3.33.2 Printer Location

If an EGD is equipped with a printer, it shall be located in a locked area of the EGD (e.g., require opening of the main door to access), but not in the logic area or the drop box. This requirement ensures that changing the paper does not require access to the drop (cash) or logic areas.

3.33.3 Printer Error Conditions

A printer shall have mechanisms to allow software to interpret and act upon the following conditions:

- a) Out of paper/paper low;
- b) Printer jam/failure; and
- c) Printer disconnected which may only be detected when the software tries to print.

Note: These conditions shall trigger an error condition to indicate the error has occurred, see also **Section 4.13 Error Conditions**.

3.34 Ticket Validation

3.34.1 Payment by Ticket Printer

Payment by ticket printer as a method of credit redemption is only permissible when:

- a) The EGD is linked to a Validation System, which allows validation of the printed ticket. Validation approval or information shall come from the Validation System in order to

- validate tickets. Tickets may be validated at any location, as long as it meets the standards in this section. Provisions must be made if communication is lost, and validation information cannot be sent to the Validation System, thereby requiring the manufacturer to have an alternate method of payment. The Validation System must be able to identify duplicate tickets to prevent fraud by reprinting and redeeming a ticket that was previously issued by the EGD; or
- b) By use of a BCLC and GPEB approved alternative method that includes the ability to identify duplicate tickets to prevent fraud by reprinting and redeeming a ticket that was previously issued by the EGD.

4 Software Requirements

4.1 Introduction

This section of the TSD shall set forth the technical requirements for the Rules of Play of the game.

4.2 Rules of Play

4.2.1 Display

- a) Payglass/Video Display. Payglasses or video displays shall be clearly identified and shall accurately state the rules of the game and the award that will be paid to the player when the player obtains a specific win. The payglasses or video displays shall clearly indicate whether awards are designated in denominational units, currency, or some other unit. The EGD shall reflect any change in award value, which may occur in the course of play. This may be accomplished with a digital display in a conspicuous location to the EGD, and the game must clearly indicate such. All payable information should be able to be accessed by a player, prior to them committing to a bet. Payglasses or video displays shall not be certified if the information is inaccurate or may cause confusion. The “reasonable player” standard shall be used for evaluation;
- b) Upcoming wins. The game shall not advertise ‘upcoming wins,’ for example three (3) times pays coming soon;
- c) Fever Mode. Each game which features a “fever” mode (a mode which gives the player an opportunity for the following ‘X’ number of hands to achieve a certain winning combination with the pay-off being some number of bonus credits) should include the number of hands remaining for the “fever” mode pay-off during each game that fever mode is present. The same shall apply to free games awarded as a result of a previous event; and
- d) Multiple Decks of Cards. Any games which utilize multiple decks of cards should alert the player as to the number of card decks in play.

4.2.2 Information to be Displayed

An EGD shall display, or shall have displayed on the glass, the following information to the player at all times the machine is available for player input:

- a) The player’s current credit balance;
- b) The current bet amount. This is only during the base game or if the player can add to the bet during the game;
- c) All possible winning outcomes, or be available as a menu item or on the help menu;
- d) Win amounts for each possible winning outcome, or be available as a menu or help screen item;
- e) The amount won for the last completed game (until the next game starts or betting options are modified); and
- f) The player options selected (e.g., bet amount, lines played) for the last completed game (until the next game starts or a new selection is made).

4.2.3 Multi-Line Games

- a) Each individual line to be played shall be clearly indicated by the EGD so that the player is in no doubt as to which lines are being bet on; and
- b) The winning playline(s) shall be clearly discernable to the player. (e.g., on a video game it may be accomplished by drawing a line over the symbols on the playline(s) and/or the flashing of winning symbols and line selection box. Where there are wins on multiple lines, each winning playline may be indicated in turn. This would not apply to reel slot games).

4.2.4 Game Cycle

A game is considered completed when the final transfer to the player's credit meter takes place (in case of a win), or when all credits wagered or won that have not been transferred to the credit meter, are lost. The following are all considered to be part of a single game:

- a) Games that trigger a free game feature and any subsequent free games;
- b) "Second screen" bonus feature(s);
- c) Games with player choice (e.g., Draw Poker or Blackjack);
- d) Games where the rules permit wagering of additional credits (e.g., Blackjack insurance or the second part of a two-part Keno game); and
- e) Double-up/Gamble features.

4.3 Mechanical and Electro-Mechanical RNG Requirements

4.3.1 Game Selection Process

- a) All Combinations and Outcomes Shall Be Available. Each possible permutation or combination of game elements that produces winning or losing game outcomes shall be available for random selection at the initiation of each play, unless otherwise denoted by the game;
- b) No Near Miss. After selection of the game outcome, the EGD shall not make a variable secondary decision, which affects the result shown to the player. For instance, the RNG chooses an outcome that the game will lose. The game shall not substitute a particular type of loss to show to the player. This would eliminate the possibility of simulating a 'Near Miss' scenario where the odds of the top award symbol landing on the payline are limited but frequently appear above or below the payline;
- c) No Corruption from Associated Equipment. An EGD shall use appropriate communication protocols to protect the RNG and random selection process from influence by associated equipment, which may be communicating with the EGD.

4.3.2 RNG Requirements

Where use of an RNG results in the selection of game symbols or production of game outcomes, the selection shall:

- a) Be statistically independent;
- b) Conform to the desired random distribution;
- c) Pass various recognized statistical tests; and
- d) Be unpredictable.

4.3.3 Applied Tests

BCLC and/or the ATF may employ the use of various recognized tests to determine whether or not the random values produced by the RNG pass the desired confidence level of 95%. These tests may include, but need not be necessarily limited to:

- a) Chi-square test;
- b) Equi-distribution (frequency) test;
- c) Gap test;
- d) Overlaps test;
- e) Poker test;
- f) Coupon collector's test;
- g) Permutation test;

- h) Kolmogorov-Smirnov test;
- i) Adjacency criterion tests;
- j) Order statistic test;
- k) Runs tests (patterns of occurrences should not be recurrent);
- l) Interplay correlation test;
- m) Serial correlation test potency and degree of serial correlation (outcomes should be independent of the previous game); and
- n) Tests on subsequences.

4.3.4 Background RNG Activity Requirement

The RNG shall be cycled continuously in the background between games and during game play at a speed that cannot be timed by the player. It is recognized that some time during the game, the RNG may not be cycled when interrupts have suspended game operation. This exception must be kept to a minimum, and will only be approved by GPEB where the suspension of RNG cycling does not represent a threat to the non-predictability of game play.

4.3.5 RNG Seeding

The first seed shall be randomly determined by an uncontrolled event. After every game there shall be a random change in the RNG process (new seed, random timer, delay, etc.). This will verify the RNG doesn't start at the same value, every time. It is permissible not to use a random seed; however, the manufacturer must ensure that the seed value is secure, and that games will not synchronize.

4.3.6 Live Game Correlation

Unless otherwise denoted on the payglass, where the EGD plays a game that is recognizable such as Poker, Blackjack, Roulette, etc., the same probabilities associated with the live game shall be evident in the simulated game. For example, the odds of getting any particular number in Roulette where there is a single zero (0) and a double zero (00) on the wheel, shall be 1 in 38; the odds of drawing a specific card or cards in Poker shall be the same as in the live game. For other EGD (such as spinning reel games or video spinning reel games), the mathematical probability of a symbol appearing in a position in any game outcome shall be constant.

4.3.7 Card Games

The consequences for games depicting cards being drawn from a deck are the following:

- a) At the start of each game/hand, it is recommended that the first hand of cards shall be drawn fairly from a randomly-shuffled deck; the replacement cards aren't drawn until needed;
- b) Cards once removed from the deck shall not be returned to the deck except as provided by the rules of the game depicted;
- c) As cards are removed from the deck they shall be immediately used as directed by the Rules of the Game (i.e., the cards are not to be discarded due to adaptive behaviour by the EGD).

4.3.8 Ball Drawing Games

The consequences for games depicting balls being drawn from a barrel (e.g., Keno) are as follows:

- a) At the start of each game, only balls applicable to the game are to be depicted. For games with bonus features and additional balls that are selected, they should be chosen from the original selection without duplicating an already chosen ball;
- b) The barrel shall not be re-mixed except as provided by the rules of the game depicted; and
- c) As balls are drawn from the barrel, they shall be immediately used as directed by the Rules of the Game (i.e., the balls are not to be discarded due to adaptive behaviour by the EGD).

4.3.9 Scaling Algorithms

- a) If a random number with a range shorter than that provided by the RNG is required for some purpose within the EGD, the method of re-scaling, (i.e., converting the number to the lower range), is to be designed in such a way that all numbers within the lower range are equally probable.
- b) If a particular random number selected is outside the range of equal distribution of re-scaling values, it is permissible to discard that random number and select the next in sequence for the purpose of re-scaling.

4.3.10 Mechanical Based RNG Games

Mechanical based RNG games are games that use the laws of physics to generate the outcome of the game. All mechanical based RNG games must meet the requirements of this TSD with the exception of **Sections 4.3.4, 4.3.5 and 4.3.9** that dictate the requirements for electronic RNGs. In addition, mechanical based RNG games must meet the following rules:

- a) BCLC and/or the ATF will test via PC communications multiple iterations to gather enough data to verify the randomness. In addition, the manufacturer may supply live data to assist in this evaluation;
- b) The mechanical pieces must be constructed of materials to prevent decomposition of any component over time (e.g., a ball shall not disintegrate);
- c) The properties of physical items used to chose the selection shall not be altered; and
- d) The player shall not have the ability to physically interact or come into physical contact or manipulate the machine physically with the mechanical portion of the game.

Note: Both BCLC and GPEB reserve the right to require replacement parts after a pre-determined amount of time for the game to comply with **Section 4.3.10, Sub-Section b)** above. In addition, the device(s) may require periodic inspections to ensure the integrity of the device. Each mechanical based RNG game shall be reviewed (and approved by GPEB) on a case-by-case basis.

4.4 Payout Percentages, Odds and Non-Cash Awards

4.4.1 Software Requirements for Percentage Payout

Each game shall theoretically payout a minimum of seventy-five percent (75%) during the expected lifetime of the game, including bonus games; see also **Section 4.5 Bonus Games**. In addition, the game must meet the following rules:

- a) Optimum Play Used for Skill Games. EGDs that may be affected by player skill shall meet the requirement of **Section 4.4.1** when using a method of play that will provide the greatest %RTP over a period of continuous play.
- b) Minimum Percentage Requirement Met at All Times. The minimum percentage requirement shall be met at all times. The minimum percentage requirement shall be met when playing at the lowest end of a non-linear paytable (i.e., if a game is continuously played at a minimum bet level for its total game cycle and the theoretical %RTP is lower than the minimum percentage, then the game is unacceptable). This example also extends to games such as Keno, whereby the continuous playing of any spot combination results in a theoretical %RTP lower than the minimum percentage.
- c) Double-up or Gamble. The Double-up or Gamble options shall have a theoretical %RTP of one hundred percent (100%).

4.4.2 Progressive Game Calculations

Whenever a progressive handpay is offered as part of the EGD payout, the base amount (the lowest starting value possible) shall be included in the theoretical %RTP for purposes of satisfying the minimum percentage requirements. BCLC and/or the ATF shall provide the base amount (for use in GPEB's certification letter) as the lowest configuration. This rule shall not supersede the rules in **Section 4.4.5 Merchandise Prizes in Lieu of Cash Awards**, and see also TGS2 – Technical Gaming Standards for Progressive Gaming Devices in Gaming Venues.

4.4.3 Multiple Percentages

For games that offer multiple %RTPs, please refer to **Section 3.14.4 Configuration Setting**. For games connected by a network, security measures will be reviewed on a case-by-case basis (and approval granted by GPEB on a case-by-case basis).

4.4.4 Odds

The highest single advertised payout on each EGD shall occur, statistically, at least once in 50,000,000 games. This does not apply to multiple awards won together on the same game play where the aggregate prize is not advertised. This odds rule shall not apply to games which make it possible for a player to win the highest win multiple times through the use of free games. This rule does apply to each wager that wins the maximum award.

4.4.5 Merchandise Prizes in Lieu of Cash Awards

- a) Payout Percentage. No payout of any merchandise or thing of value shall be included in determining whether an EGD meets the established minimum %RTP requirement unless the player is given an option to claim a single, lump sum cash prize. In that case, aforementioned cash prize will be used to compute the %RTP.
 - i. Limitations (annuities – lump sum or the payment plan) on the prize amount of Merchandise shall be clearly explained to the player on the game that is offering such a prize.
 - ii. EGDs which are linked to offer the same merchandise handpay shall have the same probability of hitting the combination (adjusted for denomination of play and number of coins bet) that will award that handpay. See also TGS2 –Technical Gaming Standards for Progressive Gaming Devices in Gaming Venues.

4.5 Bonus Games

4.5.1 Bonus Games

If the game contains a 'bonus feature' including a game within a game, the following rules shall be met:

- a) The game shall display clearly to the player which game rules apply to the current game state;
- b) The game, other than those that occur randomly, shall display to the player sufficient information to indicate the current status towards the triggering of the next bonus game (i.e., if the game requires obtaining several events/symbols towards a feature, the number of events/symbols needed to trigger the bonus shall be indicated along with the number of events/symbols collected at any point);
- c) The game shall not adjust the likelihood of a bonus occurring, based on the history of prizes obtained in previous games (i.e., games shall not adapt their theoretical %RTP based on past payouts);
- d) If a game's bonus is triggered after accruing a certain number of events/symbols or combination of events/symbols of a different kind, the probability of obtaining like events/symbols shall not deteriorate as the game progresses (e.g., for identical events/symbols it is not permitted that the last few events/symbols needed are more difficult to obtain than the previous events/symbols of that kind); and
- e) The game shall make it clear to the player that they are in this mode to avoid the possibility of the player walking away from the machine not knowing the game is in a bonus mode.

4.6 Extended Play

4.6.1 General Statement

Games that have an award calculated, occurring from game play within the base game's cycle made upon the completion of a series of random occurrences, shall meet the following:

- a) Extended play awards are part of the game cycle with predetermined award values. Extended play award contributions to the %RTP are calculated consistent with awards of

- the regular game cycle. Specifically, if the cycle for extended play awards is different from the base game cycle, then the extended play awards, occurring within the base game's cycle, will be calculated as part of the game's %RTP; and
- b) Pursuant to the rules, the game shall display the rules of play for the extended play awards, the rewards associated with each extended play award, and the character combinations that will result in specific payouts. For extended play awards achieved by obtaining specific game results, the progress of the award shall be displayed.

4.7 Extra Credits Wagered during Bonus Games

4.7.1 General Statement

If a bonus or feature game requires extra credits to be wagered and the game accumulates all winnings (from the trigger and the feature) to a temporary "win" meter (rather than directly to the credit meter), the game shall:

- a) Provide a means where winnings on the temporary meter can be bet (via the credit meter) to allow for instances where the player has an insufficient credit meter balance to complete the feature;
- b) Transfer all credits on the temporary meter to the credit meter upon completion of the feature;
- c) Not exceed the max bet limit, if one is set; and
- d) Provide the player an opportunity NOT to participate.

4.8 Bonus Game's Return

4.8.1 General Statement

The game's %RTP over the cycle of both the bonus and non-bonus part of the game shall conform to the minimum theoretical %RTP.

4.9 Multiple Games on the EGD

4.9.1 Selection of Game for Display

- a) The methodology employed by a player to select and discard a particular game for play on a multi-game EGD shall be clearly explained to the player on the EGD, and be easily followed.
- b) The EGD shall be able to clearly inform the player of all games, their rules and/or the paytables before the player must commit to playing them.
- c) The player shall at all times be made aware of which game has been selected for play and is being played, as applicable.
- d) The player shall not be forced to play a game just by selecting that game. The player shall be able to return to the main menu.
- e) It should not be possible to start a new game before the current play is completed and all relevant meters have been updated (including features, gamble and other options of the game) unless the action to start a new game terminates the current play in an orderly manner.
- f) The set of games offered to the player for selection, or the pay table, can be changed only by a secure certified method which includes turning on and off games available for play through a video screen interface. The rules outlined in **Section 3.14.4 Configuration Setting** of this TSD shall govern the RAM clear control requirements for these types of selections. However, games that keep the previous payable's (the payable just turned off) data in memory, a RAM clear is not required.
- g) No changes to the set of games offered to the player for selection (or to the payable) are permitted while there are credits on the player's credit meter or while a game is in progress.

4.10 Electronic Metering within the EGD

4.10.1 Credit Meter Units and Display

The credit meter shall be maintained in credits or the equivalent Canadian cash value.

4.10.2 Tokenization

If the amount, in Canadian currency, is not an even multiple of the tokenization factor for a game or the credit amount has a fractional component, the credits displayed for that game may be displayed and played as a truncated amount, (i.e., fractional part removed). However, the fractional credit information shall be made available to the player when the truncated credit balance is zero. The fractional amount is also known as 'Residual Credit,' see also **Section 4.11 Tokenization – Residual Credits**.

4.10.3 Credit Meter – Incrementing

The value of every prize (at end of game) shall be added to the player's credit meter, except all handpays or merchandise, see also **Section 4.4.5 Merchandise Prizes in Lieu of Cash Awards**.

4.10.4 Progressives

Progressives may be added to the credit meter if either:

- a) The credit meter is maintained in Canadian monetary units; or
- b) The progressive meter is incremented to whole credit amounts; or
- c) The prize in Canadian currency is converted to credits on transfer to the player's credit meter in a manner that does not mislead the player (i.e., make unqualified statement "wins meter amount" and then rounds down on conversion) or cause accounting imbalances.

See also TGS2 – Technical Gaming Standards for Progressive Gaming Devices in Gaming Venues.

4.10.5 Collect Meter

There shall be the facility for a collect meter which will show the number of credits or cash collected by the player (the number of credits or cash collected shall be subtracted from the player's credit meter and added to the collect meter).

4.10.6 Software Meter Information Access

The software meter information shall be accessible by an authorized person.

4.10.7 Electronic Accounting and Occurrence Meters

Electronic accounting meters shall be at least eight (8) digits in length. If the meter is being used in dollars and cents, at least eight (8) digits must be used for the dollar amount. The meter must roll over to zero upon the next occurrence; any time the meter is eight (8) digits or higher and after 99,999,999 has been reached or any other value that is logical. Occurrence meters shall be at least three (3) digits in length and roll over to zero upon the next occurrence, any time the meter is higher than the maximum number of digits for that meter. The required electronic meters are as follows (accounting meters are designated with an asterisk '*'):

- a) The coins-in* (OR cash in) meter shall cumulatively count the total amounts wagered during game play, except credits that are won during the game that are subsequently risked in a double up mode.
- b) The coins-out* (OR credit out) meter shall cumulatively count all amounts won by the player at the end of the game, that were not paid by an attendant, including amounts paid by a ticket printer. This meter must not increment for bills inserted and cashed out (used as a change machine).
- c) The drop* meter shall maintain a cumulative count of the number of coins that have been diverted into a drop bucket and credit value of all bills and tickets inserted into the bill acceptor for play (NOTE: It is acceptable to have separate 'drop' meters for coins, bills and tickets).

- d) The handpays* meter shall reflect the cumulative amounts paid by an attendant for progressive and non-progressive handpays.
- e) The games-played meter shall display the cumulative number of games played since the last RAM clear.
- f) A cabinet door meter shall display the number of times the front cabinet door was opened since the last RAM clear.
- g) The drop door meter shall display the number of times the drop door or the bill acceptor door was opened since the last RAM clear.
- h) The cancelled credit* meter shall reflect the cumulative amounts paid by an attendant that are in excess of the credit limit and residual credits that are collected (NOTE: printer games do not require a cancelled credit meter unless; a 'printer limit' option exists on the game).
- i) The progressive occurrence meter shall count the number of times each progressive meter is activated. See also TGS2 – Technical Gaming Standards for Progressive Gaming Devices in Gaming Venues.

4.10.8 Multi-Game Game Specific Meters

In addition to the Electronic Accounting Meters required above, each individual game available for play shall have at least "Credits Bet" and "Credits Won" meters in either credits or dollars. Even if a 'double up or gamble' game is lost, the initial win amount/credits bet amount shall be recorded in the game specific meters. Alternatively, there can be separate meters that account for the double-up or gamble information, see also **Section 4.10.9**. Either way, the method of metering must be understood on the screen.

4.10.9 Double-Up or Gamble Meters

For each type of Double-up or Gamble offered, there shall be two meters to indicate the amount doubled and the amount won, which should increment every time a Double-up or Gamble occurs. If the EGD does not supply accounting for the Double-Up or Gamble information, the feature must not be enabled for use.

4.11 Tokenization – Residual Credits

4.11.1 General Statement

If residual credits exist, the manufacturer must allow a cancel credit or ticket print to remove the residual credits or return the EGD to normal game play. In addition:

- a) When the residual credits are cancelled the EGD shall update the relevant meters (e.g., cancelled credit) and the last play information;
- b) The player's current options and/or choices shall be clearly indicated electronically or by video display. These options shall not be misleading;

4.12 Communications Protocol

4.12.1 General Statement

For EGDs that are required to communicate with an online electronic game management system, please refer to the TGS3 – Technical Gaming Standards for On-line Monitoring and Control Systems (MCSs) and Validation Systems in Gaming Venues.

4.13 Error Conditions

4.13.1 General Statement

EGDs shall be capable of detecting and displaying the following error conditions and illuminate the tower light for each or sound an audible alarm. They shall be cleared either by an attendant or upon initiation of a new play sequence and be communicated to a MCS, if applicable:

- a) Coin-in jam;
- b) Coin-out jam;

- c) Hopper empty or timed out;
- d) Hopper runaway or extra Coin paid out, see also **Section 3.32 Hoppers**;
- e) Cancelled Credits;
- f) RAM error;
- g) Low RAM battery, for batteries external to the RAM itself or low power source;
- h) Currency-in jam;
- i) Program error or authentication mismatch;
- j) Door open (including bill acceptor);
- k) Reverse coin-in (coin traveling wrong way through acceptor);
- l) Reel spin errors, including a mis-index condition for rotating reels that affects the outcome of the game:
 - i. The specific reel number shall be identified in the error code;
 - ii. In the final positioning of the reel, if the position error exceeds one-half of the width of the smallest symbol excluding blanks on the reel strip; and
 - iii. Microprocessor controlled reels shall be monitored to detect malfunctions such as a reel which is jammed, or is not spinning freely, or any attempt to manipulate their final resting position.
- m) Power reset.

Note: This rule also applies to the conditions listed in **Section 3.28 Bill Acceptor Error Conditions** and **Section 3.33.3 Printer Error Conditions**.

4.13.2 Error Condition Description

For games that use error codes, a description of EGD error codes and their meanings shall be affixed inside the EGD. This does not apply to video-based games; however, video based games shall display meaningful text as to the error conditions.

4.14 Program Interruption & Resumption

4.14.1 Interruption

After a program interruption (e.g., power down), the software shall be able to recover to the state it was in immediately prior to the interruption occurring.

4.14.2 Restoring Power

If an EGD is powered down while in an error condition, then upon restoring power, the error message shall be displayed and the EGD shall remain locked-up. This is unless power down is used as part of the error reset procedure, or if on power up or door closure, the EGD checks for the error condition and detects that the error is no longer in existence.

4.14.3 Simultaneous Inputs

The program shall not be adversely affected by the simultaneous or sequential activation of the various inputs and outputs, such as 'play buttons', which might, whether intentionally or not, cause malfunctions or invalid results.

4.14.4 Resumption

On program resumption, the following procedures shall be performed as a minimum requirement:

- a) Any communications to an external device shall not begin until the program resumption routine, including self-tests, is completed successfully;
- b) EGD control programs shall test themselves for possible corruption due to failure of the program storage media. The authentication may use the checksum; however, it is preferred that the Cyclic Redundancy Check (CRC) calculations are used as a minimum (at least 16 bit). Other test methodologies shall be of a certified type; and
- c) The integrity of all critical memory shall be checked.

4.14.5 Microprocessor Controlled Reels

(e.g., stepper motor reels) shall re-spin automatically to the last valid play-mode result when the play mode is re-entered, and the reel positions have been altered (e.g., the main door is closed, power is restored, audit mode is exited, or an error condition cleared).

4.15 Door Open/Close

4.15.1 Required Door Metering

The software shall be able to detect and meter access to doors and secure areas.

4.15.2 Door Open Procedures

When the EGD's main door is opened, the game shall cease play, enter an error condition, display an appropriate error message, disable coin acceptance and bill acceptance, and either sound an alarm or illuminate the tower light or both.

4.15.3 Door Close Procedures

When the EGD's main door is closed, the game shall return to its original state and display an appropriate error message, until the next game has ended.

4.16 Large Cash Transaction Reporting (LCTR) Limits

4.16.1 General Statement

All submissions under this TSD must take into account that all winners of jackpots in excess of \$9,999.99, in gaming venues in British Columbia, are required under the Proceeds of Crime (Money Laundering) and Terrorist Financing Act/Regulations to complete a Large Cash Transaction and Foreign Exchange Record (LCTR) at the time of the win.

4.17 Test/Diagnostic Mode

4.17.1 General Statement

If in a test mode, any test that incorporates credits entering or leaving the EGD (e.g., a hopper test) shall be completed on resumption of normal operation. In addition, there shall not be any test mode that increments any of the electronic meters. Any credits on the EGD that were accrued during the test mode shall be cleared before the test mode is exited. Test meters are permissible provided the meter indicates as such.

4.17.2 Entry to Test/Diagnostics Mode

The main cabinet door of the EGD may automatically place the EGD in a service or test-mode. Test/diagnostics mode may also be entered, via an appropriate instruction, from an attendant during an audit mode access.

4.17.3 Exiting From Test/Diagnostic Mode

When exiting from test mode, the game shall return to the original state it was in when the test mode was entered.

4.17.4 Test Games

If the device is in a game test mode, the machine shall clearly indicate that it is in a test mode, not normal play.

4.18 Last Game Recall

4.18.1 Number of Last Plays Required

Information on at least the last five (5) games is to be always retrievable on the operation of a suitable external key-switch, or another secure method that is not available to the player.

4.18.2 Last Play Information Required

Last play information shall provide all information required to fully reconstruct the last five (5) plays. All values shall be displayed, including the initial credits, credits bet, credits won, and credits paid. If a progressive was awarded, it is sufficient to indicate the progressive was awarded and not display the value. This information should include the final game outcome, including all player choices and bonus features. In addition, the results of Double-up or Gamble (if applicable).

4.18.3 Bonus Rounds

The five (5) game recall shall reflect bonus rounds in their entirety. If a bonus round lasts 'x number of events,' each with separate outcomes, each of the 'x events' shall be displayed with its corresponding outcome, if the outcome results in an award. The recall shall also reflect position dependent events if the outcome results in an award. For games that may have infinite free games, there shall be a minimum of fifty (50) games recallable.

4.19 Software Verification

4.19.1 General Statement

The device shall have the ability to allow for an independent integrity check of the device's software from an outside source. This can be accomplished by the medium being able to be removed and authenticated by a third-party device, or having an interface port for a third-party device to authenticate the media. This integrity check will provide a means for field testing the software to identify and validate the program.

5 Slot Tournaments

5.1 Tournament Description

5.1.1 General Statement

A slot tournament is an organized event that permits a player to either purchase or be awarded the opportunity to engage in competitive play against other players.

5.2 Tournament Program

5.2.1 General Statement

Each EGD may be equipped with a certified program which allows for tournament mode play. If tournament is an option, it shall be enabled by a switch key (reset feature) and/or total replacement of the logic board with a certified tournament board.

5.3 Tournament – Hardware

5.3.1 General Statement

The game shall comply with the requirements set forth in **Section 3** of this TSD, if applicable.

5.4 Tournament – Software

5.4.1 General Statement

No machine, while enabled for tournament play, shall accept coins or tokens, nor pay out coins or tokens, but shall utilize credit points only. Tournament credits shall have no cash value. These machines shall not increment any mechanical or electromechanical meters, and all machines in the tournament shall be identical. The percentage requirements as addressed in **Section 4.4** are waived for tournament games.

5.4.2 Machine Settings

All machines used in a single tournament shall utilize the same electronics and machine settings, including reel speed settings.