



Multi-Jurisdictional Testing Framework

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Purpose

To establish a framework, agreed between the participating jurisdictions, for the independent testing of remote (online) gaming product.

Testing performed to the standards contained in this framework will be recognised by the participating jurisdictions.

Scope

This framework applies to remote (online) gambling regulation. This second release of the framework adds:

- Standards for the testing of games, and the reporting of game test results.

Included from the first release are:

- Standards for the testing of random number generators (RNG), and the reporting of RNG test results.
- Good practise guidelines for testing laboratories to adhere to.

It is intended that the framework scope will increase as new aspects are agreed and incorporated.

Background

It is increasingly the case that gambling regulators are utilising the services of outsourced specialist testing laboratories for the purpose of game fairness testing. To date, each jurisdiction has generally developed their own technical standards and testing requirements and appointed these external specialist testing laboratories to carry out testing against those standards. Although the individual technical standards often differ between jurisdictions, there is a core element that is common and the goal of regulators is the same – that is to ensure the fairness of gambling products offered to players.

Often in the remote industry, it is the same product (game) that is being offered into each jurisdiction without modification apart from some contextual functionality, such as the language or player account and reporting functionality. Where there are areas in technical standards that are common between regulators, it makes sense to agree on an approach for the testing of that product. Different regulators with common goals could each benefit from sharing what they consider best practise in order to develop a common agreed framework.

Process

This framework is not intended to replace existing requirements in any of the participating jurisdictions. It is intended that, where a jurisdiction has signed up to this framework, they will recognise testing performed against this standard for the purposes of their RNG and game testing requirements. That is to say that, once an RNG or game has been tested against this standard, it would not be necessary to duplicate testing in order for it to be considered for release in any one of the participating jurisdictions.

The labs performing the testing must be recognised as suitable to carry out remote product testing in each of the participating jurisdictions in order for it to be considered for release in those jurisdictions. Where a testing lab is only recognised in a subset of the participating jurisdictions for this framework, then testing performed by that lab would only be valid in those subset jurisdictions (unless stated otherwise by any other participating jurisdiction).

Once a product has been tested in accordance with this framework, gambling operators would still need to adhere to the individual requirements relating to the release of new product in each jurisdiction. For example, where a jurisdiction requires a copy of the testing report or any other supporting forms or information, then operators would need to follow those processes and include this framework's testing evidence as required.

Agreed standards

Attached as appendices are the agreed standards.

Appendix A – Testing facility operational guidelines. This attachment outlines the operational processes a regulator would expect are in place within a testing laboratory. It covers aspects such as the organisation's structure and independence; personnel and infrastructure; and general procedures and operations.

Appendix B – Random number generator (RNG) testing and reporting. This standard outlines the general characteristics of RNGs and how they should be tested. It also details what information should be included in the testing report. The aim of this is to ensure all testing laboratories are testing to an equivalent standard, and the scope and results of testing is transparently documented.

Appendix C – Game testing standards and reporting. This standard outlines the general characteristics of games of chance and how they should be fairness tested. It also details what information should be included in the testing report. The aim of this is to ensure all testing laboratories are testing to an equivalent standard, and the scope and results of testing is transparently documented.

Game updates are also included in game testing Appendix C. These outline how updates to previously tested games are treated in terms of whether external re-testing is required. It also describes the expected change control management.

Appendix A - Operational guidelines for Testing Facilities

September 2015 v1.0

BACKGROUND

For a regulator to accept the testing performed by a testing facility in another jurisdiction, they would need a level of assurance over the suitability and capability of that testing facility. This document aims to outline the areas that a regulator would expect to be present in a testing facility participating in testing exchange. It assumes any outsourced testing facility is already subject to the regulation of the host jurisdiction. This means that the testing facility has already undergone the 'on entry' probity, independence, competence and financial fitness checks required by the local regulator (i.e. the testing facility has undergone a licensing or similar approval process).

Whilst this document does not specifically cover the 'on entry' checks a regulator would perform on a testing facility¹, it will touch on similar areas as part of ongoing suitability. It will cover in more detail the independence and competence areas as these are different to what is expected of a gambling operator.

It serves as a guideline of the operational aspects that a testing facility should have in place. The regulator's requirements placed on a testing facility may differ within each jurisdiction and local legislation will always take precedent.

1. ORGANISATION

1.1. Alignment / Independence

The testing facility must be independent and not aligned to any party in the gaming industry, e.g. gambling software developers, operators and equipment service providers. The testing facility may be an adjunct to a regulatory body.

The testing facility must not:

- a) enter into any conflicting commercial dealing with a gambling operator;
- b) have any direct or indirect pecuniary interest in a gambling operator;
- c) participate in or be involved in a gambling operator's design, manufacture, selection, purchase, supply, installation, service or operation of any gambling products or services anywhere in the world.

Clauses 1.1(a) and 1.1(b) do not apply where:

¹ Those checks are similar to what would be conducted for a gambling operator's licence application and is outside the scope of this work (Note: a licence application form produced by IAGR is available on the website for this purpose).

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- a) the testing facility is testing, evaluating and certifying gaming equipment in accordance with its accreditation as an testing facility;

Note: It is acknowledged that testing facilities often provide a range of services not related to fairness testing. These are permitted providing such work does not affect the impartiality of any testing services offered.

1.2. Continuity of supply

The testing facility must demonstrate a sufficiently stable and continuing business, such that a regulator may rely upon it for the supply of testing services to the gaming industry over an adequate period of time.

Note: It is not uncommon for a testing facility to generate some of its business from sources outside the gaming industry.

1.3. Professional liability indemnity insurance

The testing facility must carry an appropriate level of professional liability indemnity insurance or ensure adequate arrangements are in place to manage any liability resulting from the provision of testing services.

1.4. Organisation and management structure

The testing of gaming equipment is complex and requires an understanding of the industry at management and operational level and specific technical skills.

The testing facility will be required to satisfy the regulator that its management possesses an adequate understanding of the gaming industry, the major issues involved, and that it is organised appropriately to be able to address those issues.

The testing facility must demonstrate that it is capable in the areas of:

- a) understanding and knowledge of the gaming industry;
- b) understanding the needs for equipment and facilities;
- c) controlled and documented procedures;
- d) testing rigor;
- e) confidentiality; and
- f) regulatory compliance.

such that the regulator is confident that the organisation fully understands its commitment and is able to provide testing services to the gaming industry.

The organisation must be capable of completing test and evaluation functions without the need to assign, delegate, subcontract or otherwise engage any person not directly employed by the organisation to carry out the testing or evaluation of gaming equipment except for :-

- a) the testing of electromagnetic, electrostatic, radio frequency, magnetic or similar interference;
- b) testing against electricity standards;
- c) information security or other none gambling specialist areas. Where specialist functions do require outsourced assistance, notification must be given to the relevant regulator.

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1.5. ISO/IEC17025 Accreditation

The testing facility must be accredited to ISO/IEC 17025² by an accreditation body that is a Signatory to the [ILAC](#) Mutual Recognition Arrangement in the field of Information Technology Testing for class 22.02 Gaming Software Tests.

If the testing facility is in the process of being assessed by an ILAC accreditation body for such accreditation, they may still be able to commence testing work however accreditation must be obtained prior to the issuance of testing certificates.

Note: Accreditation to ISO/IEC 17025 will mean that the organisation operates in accordance with ISO 9001 standards for quality management systems.

1.6. Compliance Committee

The testing facility must establish a Compliance Committee which is empowered and appropriately staffed to undertake probity investigations, investigate business policies and practices as they relate to the testing of gaming equipment, and to investigate instances of the improper or inadequate conduct of evaluating, testing and certifying gaming equipment.

The Compliance Committee will undertake investigations as requested by the regulator, and provide the results of those investigations in written reports to the regulator.

2. PERSONNEL

2.1. Skills and Qualifications

It is expected that the testing facility will employ appropriately qualified, competent and experienced staff having the relevant skills and qualifications, such as:

- a) Computer science/programming;
- b) Mathematics/statistics;
- c) Electrical/electronic engineering;
- d) Data communications and encryption;
- e) Quality management; and
- f) Information security.

2.2. Quality Manager

As required of a quality-accredited organisation, the testing facility must have a designated Quality Manager.

The Quality Manager will have ultimate responsibility in ensuring the consistent quality of deliverables, however, this responsibility may be delegated to other appropriate and independent members of staff.

² ISO/IEC 17025 is the 'General requirements for the competence of testing and calibration laboratories', as issued by the International Organization for Standardization.

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The Quality Manager will have the right to refuse to release a deliverable if, in his or her opinion, it does not meet the organisation's requirements for quality.

2.3. Backup for key personnel

The testing facility must demonstrate that it has appropriate policies and programs to ensure that the required skills and qualifications can be provided by more than one staff member. This requires that suitably trained 'back-up' staff are available when key personnel are unavailable.

2.4. Cross Training

The testing facility must have in place procedures for transferring specialised knowledge from key personnel to other personnel in the organisation.

2.5. Probity

The testing facility will have procedures and maintain records to ensure that all principals, directors and employees involved in testing satisfy the requirements of the regulator in regard to personal probity and that employees do not have vested interests in any aspect of the gambling industry.

2.6. Personnel Induction

The testing facility will have in place procedures to ensure that:

- a) all personnel have satisfied the requirements of the regulator in regard to any probity checking and the obtaining of any necessary licences or approvals before commencing work on the testing of gaming equipment;
- b) all personnel are trained to comply with the organisation's quality management systems shortly after commencing employment;
- c) all personnel are familiar with the organisation's code of conduct;
- d) details of any change in principals, directors and testing personnel are notified to each relevant regulator including, for commencing principals, directors and staff, details of nature of and jurisdiction where probity checking was satisfied.

3. INFRASTRUCTURE

3.1. Security and Access Control

The testing facility's test environment must be controlled to allow access to authorised employees only or authorised third parties, and all equipment, samples and records of testing, whether in a physical or electronic form, must be:

- a) maintained in a secure environment, and
- b) controlled to allow access to authorised employees only.

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3.2. Record Keeping

The testing facility must retain all records³ associated with the testing of gaming equipment.

All such records must be:

- a) retained for a period not less than five years;
- b) stored in or transferred to a format which is accessible by the regulator and does not alter the content of the records; and
- c) protected from unauthorised access.

3.3. Test Equipment and Tools

The testing facility must have appropriate test equipment, devices and software for the testing of gaming equipment. It is highly desirable that the testing facility provides a testing environment which is representative of the infrastructure and conditions that will be found in operation. The testing facility must test in an environment that accurately reflects the intended live environment. If it's necessary to replicate an eGambling system or to be able to supervise a build performed on an operator's equipment, then the necessary arrangements must be within the testing facility to allow for this.

Where remote connection to an operator's system is required, the testing facility must ensure:

- a) Records of the system infrastructure, environment variables and versions of software are kept;
- b) That there are technical means of determining remotely, beyond reasonable doubt, that the systems that are subject to compliance testing are the same as, or representative of, the systems to be put into production.

4. PROCEDURES AND OPERATIONS

The testing facility must follow documented procedures and methods suitable for testing gaming equipment to standards and legislation of or similar to those required by regulators.

Alternatively, the testing facility may demonstrate its capability to develop documented procedures and methods to address such requirements, using examples taken from another relevant field.

4.1. Technical Standards

The testing facility must demonstrate a knowledge of and capacity to test gaming equipment against relevant technical standards and/or incorporated documents which may apply to such equipment.

4.2. Procedures for testing

³ Records' includes all correspondence with relevant parties and submission materials (or a way of verifying the authenticity of any copy of materials).

For the **fairness testing of games of chance**, the testing facility must have or be capable of developing test procedures and methods in the following areas:

- a) game design and implementation;
- b) random number generators;
- c) statistical characteristics and probability;
- d) game rules and return to player verification;
- e) progressive jackpots;
- f) peer-to-peer;
- g) program code and software compilation; and
- h) software verifiability and reproducibility.

For **eGambling platform testing**, the testing facility must have or be capable of developing test procedures and methods which cover the testing of the following areas:

- a) customer registration and accounts;
- b) data gathering, player tracking and bonus points systems;
- c) centralised progressive jackpot controllers;
- d) common wallet systems;
- e) transaction logging and reporting;
- f) communication protocols and encryption;
- g) network traffic; and
- h) software verification.

Where **information security reviews** are performed, the testing facility must have or be capable of developing test procedures and methods which cover testing of the following areas:

- a) IT governance;
- b) physical and logical access controls;
- c) backups and system recovery;
- d) audit logging and reviews; and
- e) software change and release management.

The testing procedures and methods must be able to verify the correct transfer of data between the various layers of an eGambling system (operating systems, networks, applications and databases) and that each interface correctly processes data.

Note: The operation of gaming equipment will, from time to time, indicate problems with systems that are already in the field. The testing facility must be able to re-test games or equipment to determine whether the identified problems are present in these other previously tested items.

4.3. Cooperation with regulators and key event reporting

Regulators expect testing facilities to work in an open and cooperative way and to inform the regulator of any matters they would reasonably need to be aware of in exercising its regulatory functions. The testing facility must ensure they are able to discuss any aspect of gaming equipment and software testing with the relevant regulator in the jurisdiction the product is being tested for.

Matters that may have a material impact on the testing facility's business or ability to conduct testing should be notified to the relevant regulator as soon as reasonably practicable, include the following:

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- a) Relevant changes to the circumstances of the organisation or the individuals employed by the organisation.
- b) Any investigation by a professional, statutory, regulatory or government body into the testing facility's activities, or the activities of a person occupying a key position employed by them, where such an investigation could result in the imposition of a sanction or penalty which, if imposed, could reasonably be expected to raise doubts about the continued suitability to test gambling equipment.
- c) The commencement of investigations by an internationally recognised accreditation body into your conduct as a testing facility or your testing of gambling systems.
- d) The suspension or revocation of the testing facility's ISO 17025 accreditation.
- e) Any breach in the testing facility's information security where that adversely affects the confidentiality of client data.
- f) Any other matters that have a material impact on the business or on the ability to conduct its business.

Testing facilities should have a whistle blower policy in place allowing any member of staff to report issues of concern to management or directly to the regulator. All testing facility staff members are to be made aware of the communication process they can use to report integrity concerns; for notifying the regulator, they should be issued with a contact email address of the regulator within each jurisdiction for whom they provide testing.

5. GLOSSARY

- Gaming equipment: Gambling product, software or ancillary equipment developed for gambling.
- Gambling Operator: A gambling software developer or a gambling operator that provides remote gambling facilities.

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Appendix B - RNG Testing Standards

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September 2015 V1.0

Randomness

Regulatory strategy for testing and certification

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1. Introduction

This document establishes a strategy relating to random numbers, whether determined by a pseudo-random number generator (pRNG) usually in software, or a random number generator (RNG) by a suitable physical phenomenon (electrical, mechanical, radioactive, etc) – all being RNGs for the purpose of this document.

The purpose of this document is to establish generic RNG requirements and a minimum approach for their testing and certification by testing facilities. Following this framework will allow regulatory authorities to readily compare RNG certifications from other jurisdictions and different certification organisations.

2. RNG Requirements

2.1. RNG

2.1.1 General

Random number generation and game results must be ‘acceptably random’. Acceptably random here means that it is possible to demonstrate to a high degree of confidence that the output of the RNG (or pRNG), game, lottery, or virtual event outcomes are sufficiently unpredictable through, for example, statistical analysis using generally accepted tests and methods of analysis. Adaptive behaviour (i.e. a compensated game) is not considered appropriate.

2.1.2 Attributes

RNG’s should be capable of demonstrating the following qualities: the output from the RNG is uniformly distributed over the entire output range and game, lottery, or virtual event outcomes are distributed in accordance with the expected/theoretical probabilities.

2.1.2.1 Software

Software pseudo-random number generators must demonstrate the following qualities:

- a. the output of the RNG, game, lottery, and virtual event outcomes should be unpredictable, for example, for a software RNG it should be computationally infeasible to predict what the next number will be without complete knowledge of the algorithm and seed value;
- b. random number generation does not reproduce the same output stream (cycle), and that two instances of a RNG do not produce the same stream as each other (synchronise);
- c. any forms of initialisation, seeding and re-seeding used do not introduce predictability;
- d. cycle (produce output) in the background, unless specifically designed to work “on demand”; and
- e. seeding sources should be demonstrably random sources of entropy.

2.1.2.2 Hardware

For games or virtual events that use the electrical, mechanical, or physics phenomena to generate the outcome of the game (hardware RNGs), the hardware RNG used should be capable of meeting the requirements in section 2.1.2.1 0 where applicable and in addition:

- a. mechanical components should be constructed of materials to prevent decomposition of any component over time (e.g. a ball shall not disintegrate);
- b. the properties of physical items used to choose the selection should not be alterable; and
- c. players should not have the ability to interact with, come into physical contact with, or manipulate the electrical, physics, or mechanical derivation of the results.

Where a hardware RNG utilises a software pseudo-RNG for failover purposes, the pRNG must meet the requirements of section 2.1.

2.2. Mapping & scaling

Any scaling applied to the output of the random number generator maintains the qualities in section 2.1.

Degrees of freedom of the output should be verified by standard methods.

2.3. Use of random numbers

When random numbers, scaled or otherwise, are received, e.g. following a game requesting a sequence of random numbers, they are to be used in the order in which they are received. For example, they may not be discarded due to adaptive behaviour.

Numbers or sequences of numbers are not to be discarded, unless they fall outside the expected range of numbers required by the virtual event – such an occurrence should result in an error being logged and investigated.

Restricting adaptive behaviour prohibits automatic or manual interventions that change the probabilities of game outcomes occurring during play. Restricting adaptive behaviour is not intended to prevent games from offering bonus or special features that implement a different set of rules, if they are based on the occurrence of random events.

2.3.1 Monitoring

The output of RNGs should be monitored with real-time statistical tools. The purpose of monitoring is early detection of abnormal statistical behaviour enabling timely appropriate remedial action. Any abnormalities should result in an error being logged and investigated.

Best practice monitoring will include independent mapping between RNG output and game symbols should verify game symbol usage. RNG output –v- game symbols logs may be maintained and verified as a non-real-time monitoring exercise.

2.3.2 Security

Security of generated numbers must be maintained through to their usage (e.g. numbers are not transmitted unencrypted between RNG server and game server). RNG output and game symbols should be used immediately and should not be unnecessarily stored in memory before use.

Unless the software is designed to operate differently, the seeding or restarting of RNGs should be minimised.

3. Reporting results of RNG testing

RNG reports should contain all pertinent information so as to enable vendor-to-vendor and tester-to-tester comparisons and to enable the regulator to clearly see the scope of testing.

The purpose of the following isn't to mandate the format of a test report; it is to outline the minimum elements that would be expected to be contained within reports. How the lab selects to display the information is up to them (in table format, different order to that outlined below, etc), so long as all the minimum information is present.

3.1 Test Laboratory Details

Contact details of test laboratory, physical location(s) where testing was performed, date(s) of testing including any resubmissions required and certificate reference number – certification signed off by test supervisor.

3.2 Executive summary

3.2.1 Introduction

Introduction about the supplier, system (online casino, poker, lottery) utilising the RNG, jurisdiction and applicable compliance standards/requirements (including date and version).

3.2.2 Description of RNG

Briefly describe the RNG and its use in the gaming/lottery system.

3.2.3 Scope of testing

NOTE: Vendor generated output testing only is an unacceptable scope.

In scope/out of scope technical standards/features of RNG or RNG related features of the gaming/lottery system.

Scope should specifically state the basis of the findings:

- a. vendor supplied output testing (include industry standard hash of the sequence provided);*
- b. tester generated output from vendor supplied source (include hash of the source code provided and descriptive identifiers of build and operational environment specifications provided by vendor and hash of the documents stipulating such matters);*
- c. source code review;*
- d. theoretical basis of algorithm and supporting crypto-analysis evidence; and/or*
- e. limitations of assurance because of scope of testing (range, degrees of freedom, seeding, re-starting, etc) likely foreseen by tester.*

3.2.4 Limitations of use of RNG

Any limitations on the use of the RNG should be cited. This might include but not be limited to:

- the acceptable degrees of freedom (DOF) permitted for the RNG,*
- whether it is suitable for use with / without replacement, and*

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- any dependency on operating system functionality that, if modified, could impact the operation of the RNG (e.g. Java SecureRandom).

3.2.5 Conclusion

Conclusion of evaluation – RNG complies or RNG complies under certain conditions.

3.3 Detailed test results

3.3.1 Test methodology

It is anticipated that NIST tests and / or Diehard Tests shall be used when evaluating random sequences. The qualified tester will choose the appropriate tests on a case by case basis depending on the RNG under review.

The RNG has been evaluated by performing the following tasks:

1. Review of RNG documentation to understand the implementation of RNG in the gaming system.
2. Research about RNG algorithm/hardware to ensure there is no publicly known weakness or vulnerabilities associated with the RNG under evaluation.
3. Review of source code to verify that the implementation of RNG is in accordance with the RNG documentation.
4. Statistical testing of raw output of RNG and scaled/shuffled decks data.
5. Any issues or non-compliance are reported to the supplier who resolve these issues. Once the issues are resolved, these are re-evaluated to confirm the non-compliance has been addressed adequately.

Complete the table below using the following column values.

Req No. Compliance requirement number

Req Description. Description of the compliance requirement

Compliance Status Comply/Does Not Comply/Not Applicable/Out of Scope

Comments Describe how RNG complies with the compliance requirement OR why the RNG does not comply OR why the compliance requirement is not applicable OR why the compliance requirement is out of scope

| Req No. | Requirement Description | Compliance Status | Comments |
|---------|-------------------------|-------------------|----------|
| 2.1.1 | General | | |
| 2.1.2 | Attributes | | |
| 2.1.2.1 | Software pRNGs | | |
| a | | | |
| b | | | |
| c | | | |
| d | | | |
| e | | | |
| 2.1.2.2 | Hardware RNGs | | |
| ... | ... | | |
| 2.3.2 | Security | | |

| Req No. | Requirement Description | Compliance Status | Comments |
|---------|-------------------------|-------------------|----------|
| | | | |

3.4 Identification of RNG

Include the following information about the RNG evaluated in this section.

3.4.1 Hardware RNG

Manufacturer:

Model:

Serial number:

Interface type (USB, serial):

Number of modules and configuration: *automatic failover, manually switch to backup module, concurrent use of multiple modules*

URL of manufacturer's website for this module:

3.4.2 Software RNG

Supplier:

Version details (unique identifier, version number):

Environment particulars: *Platform supplier and version hosting the RNG (if applicable), operating system details.*

RNG Algorithm:

Language of implementation (C++, Java, etc.):

File names and industry standard hashes

List hashes of source code files and binaries (if applicable) of the RNG evaluated.

For hardware implementation of the RNG, include hashes of the code (drivers, scaling, etc.) used to implement the RNG.

For software RNG, include hashes of the code for RNG algorithm and the code related to RNG algorithm (seeding, background cycling, scaling, etc.)

NOTE: Sufficient information should be contained in the test report to verify that any live instance of the RNG accurately reflects the tested version. This would include the file names and hashes of source code and executables, all critical files as designated by the developer and tester must be listed. In addition to the core RNG any pertinent operating environment details must be listed such as the operating system, gaming platform and other environmental variables that if modified could impact on the test certificate results.

Details of who controlled and observed the build process and generated the digital signatures must be provided.

3.5 References

List of documents used for reference (compliance requirements, literature/URLs for software RNG, URLs for hardware RNG, supplier's documentation, etc.)

Ref 1

Ref 2

etc

3.6 Annex A – statistical testing results

Describe the statistical tests carried out and the results for the raw output of RNG and scaled/shuffled decks data for each type of games (degrees of freedom) being served by the RNG.

3.6.1 Testing results for raw output of RNG

An adequate selection of NIST and / or Dieharder Tests shall be used when evaluating random sequences (raw output of RNG).

At least two random sequences (one tester generated and one vendor generated) shall be tested and these shall pass tests with a minimum confidence level of 95%.

For input data format and sample size, running these tests and interpreting the test results, refer to:

For NIST - <http://csrc.nist.gov/publications/nistpubs/800-22-rev1a/SP800-22rev1a.pdf> (Special Publication 800-22, Revision 1a)

For Dieharder - <https://webhome.phy.duke.edu/~rgb/General/dieharder.php>

Present test results here indicating success/failure of individual tests as well as overall assessment.

3.6.2 Testing results for scaled data or shuffled decks data

Chi Square/Frequency and Runs Up and Runs Down tests shall be applied to the scaled/shuffled decks data generated using the RNG being evaluated.

Degrees of Freedom (DOF) = Scaling range required for a game – 1

numbers drawn at once and whether this data is drawn with or without replacement.

At least two input data files each containing 3,000,000 scaled numbers or more shall be used for testing scaled data for every unique DOF being used by the gaming system.

At least two input data files each containing 3,000,000 shuffled cards (i.e. numbers between 0 and 51 or 1 and 52 assuming joker is not being used) or more shall be used for testing shuffled decks data

The data shall pass with a minimum confidence level of 95%.

Present test results here indicating success/failure of individual tests as well as overall assessment.

| | | |
|----------------------------------------|-------------|-------------|
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Appendix C – Game Testing Standards

Multi-Jurisdictional Testing Framework

March 2018 v1.1

Game Fairness

Regulatory strategy for testing and certification

1. Introduction

This document establishes a strategy relating to game fairness testing, it assumes the RNG that serves the game is subject to separate tests.

The purpose of this document is to specify the scope of independent testing and reporting to allow regulatory authorities to readily compare game fairness testing certifications from other jurisdictions and different certification organisations.

Section 2 outlines the common game fairness requirements. This is a generic set of requirements that as best as possible tries to reflect the common game fairness requirements in place within the participating jurisdictions. It should be noted however that where the requirements of an individual participating jurisdiction differs from the common standards outlined in section 2 the jurisdiction's requirements take precedent and must be complied with for games offered to that jurisdiction. Not all requirements listed in section 2 would require independent testing but are included for a holistic overview of game requirements.

Section 3 outlines the testing laboratory's mandatory minimum scope for new game testing.

Section 4 outlines the content that must be contained within game test reports to this standard. The objective is to ensure maximum transparency in what was tested.

Section 5 covers the change management and testing required for updates to previously tested games.

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2. Requirements

2.1. Game Fairness

Overall Objective

The objective of these requirements is to ensure that a game is conducted in a way that is fair and open to the player and in accordance with the rules provided to the player.

2.1.1 Information about the rules of the game

1. For each game, an explanation of the applicable rules must be easily available to the customer before they commit to gamble.
2. The availability of game rule information must be checked regularly; where the information is not available the game must not be available for gambling.
3. The published game information must be sufficient to explain all of the applicable rules and how to participate.
4. As applicable, the game information must include the following minimum information:
 - a) the name of the game;
 - b) the applicable rules, including clear descriptions of what constitutes a winning outcome;
 - c) any restrictions on play or betting, such as any play duration limits, maximum win values, etc;
 - d) the number of decks or frequency of shuffles in a virtual card game;
 - e) whether there are contributions to jackpots (“progressives”) and the way in which the jackpot operates, for example, whether the jackpot is won by achieving a particular outcome;
 - f) instructions on how to interact with the game; and
 - g) any rules pertaining to metamorphosis of games, for example, the number and type of tokens that need to be collected in order to qualify for a feature or bonus round and the rules and behaviour of the bonus round where they differ from the main game.
5. For multi-state or metamorphic games, as the game progresses clear information sufficient to inform the customer about the current state of the game must be displayed on screen in text and/or artwork. For example:
 - a) where a game builds up a collection of tokens (symbols, etc) the current number collected must be displayed,
 - b) where different rules apply an indication of the rules that are currently relevant, such as “bonus round” or other feature labels.
6. The rules of the game must not be unfair or misleading.
7. Game rules must not be changed during a session unless adequate advance notification is given to customer.
8. All information presented on the website and games (whether visual or auditory, written or pictorial) must not be in any manner or form indecent, illegal or offensive (e.g.: pornographic or offensive to religion or race)

| | | |
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2.1.2 Information about prizes and the chances of winning

1. For each game, information about the likelihood of winning must be easily available to the customer before they commit to gamble. Information must include:
 - a) a description of the way the game works and the way in which winners are determined and prizes allocated, for example, for peer to peer games where the likelihood of winning is influenced by the relative skill of the participants or for Bingo where the likelihood of winning is not known at the outset because it is dependent on the number of participants, a description of the way in which prizes are won or allocated is sufficient;
 - b) the theoretical return to player (RTP%) percentage which may be appropriate for a slot machine style games or other games of chance. Where games involve some element of skill the published RTP must be based on the theoretical RTP% generated by a strategy that is reasonably achievable by a customer;
2. Where games include jackpot or progressive jackpot amounts, the published information must disclose whether this is included in the overall RTP% for the game.
3. For each game, information about the potential prizes and/or payouts (including the means by which these are calculated) must be easily available. This must include, where applicable:
 - a) paytables, or the odds paid for particular outcomes.
 - b) For peer-to-peer games where the prize is determined based on the actions of the participants a description of the way the game works and the rake or commission charged.
 - c) For lotteries and other types of events where the potential amount or prize paid out may not be known before the customer commits to gamble, describing the way in which the prize amount is determined will be sufficient.
 - d) displays of jackpot amounts that change over time (“progressives”) must be regularly updated and as soon as possible after the jackpot has been reset following a win.

2.1.3 Play for fun games

Play-for-fun games must accurately represent the for-money version of the game; in particular they must not be designed to mislead the customer about the likelihood of winning in the for-money version of the game, by for example, using mappings or different probabilities that produce different outcome likelihoods.

2.1.4 Game displays

1. The name of the game must be displayed on game screens.
2. The game must display the unit and total stake for the customer’s gamble including conversions to other currencies or tokens.
3. The information displayed about the game result must be sufficient for the customer to determine whether they have lost or won and the value of any winnings.
4. Game results must be displayed for a reasonable period of time, that is, sufficient time for the customer to be able to understand the result of the game in the context of their gamble.

2.1.5 Game Fairness

1. Games must operate and interact with the customer strictly in accordance with the published rules.

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2. Games must not be designed in such a way as to mislead the customer about the likelihood of winning, by for example, substituting one losing outcome with another that represents a “near-miss”, in order to encourage a customer to believe that they came close to winning and continue gambling.
3. Games must not be designed to give the customer the perception that skill influences the outcome of a game when it does not (i.e. where the outcome is entirely random).
4. Where a game is represented or implied to include a simulation of a real-life physical device, the behaviour of the simulation must replicate the expected behaviour of the real-life physical device. For example:
 - a) the visual representation of the simulation must correspond to the features of the real-life physical device,
 - b) the probability of any event occurring in the simulation must be equivalent to the real-life physical device (e.g.: the probability of obtaining a 6 on a simulated die throw must be equal to 1 in 6),
 - c) where the game simulates multiple real-life physical devices that would normally be expected to be independent of one another, each simulation must be independent of the other simulations, and
 - d) where the game simulates real-life physical device that have no memory of previous events, the behaviour of the simulations must be independent of (i.e.: not correlated with) their previous behaviour.
5. If a cap is established on any jackpot, all additional contributions once that cap is reached must be credited to the next jackpot.
6. If the artwork contains game instructions specifying a maximum win, then it must be possible to win this amount from a single game (including features or other game options).
7. All customers contributing to a jackpot must be eligible to win that jackpot. Jackpot parameters must not be altered once live without prior approval and or customer notification.

2.1.6 No Adaptive Behaviour by Games

1. Games must not be “adaptive” or “compensated”, that is, the probability of any particular outcome occurring must be the same every time the game is played, except as provided for in the (fair) rules of the game.
2. The rules of the game must not provide for manipulations of return to player percentage based on previous turnover or money paid out, or to maintain a constant return to player percentage.
3. Restricting adaptive behaviour prohibits automatic or manual interventions that change the probabilities of game outcomes occurring during play. Restricting adaptive behaviour is not intended to prevent games from offering bonus or special features that implement a different set of rules, if they are based on the occurrence of random events.

2.1.7 No Forced Game Play

1. The customer must not be forced to play a game simply by selecting it.
2. A mechanism must be implemented to prevent repeated gamble instructions, (for example, where a customer repeatedly presses “play” while waiting for a game result) to be executed.
3. Edges of the “hot” area of buttons must be clearly defined in the artwork to prevent clicking near buttons from triggering a gamble.

2.1.8 Games in multiple languages

1. The following principles must be followed where games are provided in different language versions:
 - a) All game information must be provided in the language specified for that version,
 - b) The game instructions (and restrictions) must carry the same meaning across all language versions so that no one version is advantaged or disadvantaged, and
 - c) Where a customer may elect to play in multiple different language versions of a game they must have the same likelihood of winning regardless of which language version they choose to play.

2.1.9 Autoplay

1. The customer must retain control of the gambling where auto-play functionality is provided. The auto-play functionality must:
 - a) require the customer to choose the stake, the number of auto-play gambles and the total amount to be gambled
 - b) offer additional customer selectable options which stop auto-play when triggered.
 - c) enable the customer to stop the auto-play regardless of how many auto-play gambles they initially chose or how many remain.
 - d) not exceed the selected and maximum number of auto-plays permitted.
 - e) not override any of the display requirements (e.g. the result of each gamble must be displayed for a reasonable length of time before the next gamble commences).

2.1.10 Game History

1. Customers must be provided with a means to review the last game, either as a re-enactment or by description. The replay must clearly indicate that it is a replay of the previous game, and must provide the following information (at a minimum):
 - a) The date and time the game was played,
 - b) The display associated with the final outcome of the game.
 - c) Total customer cash / credits at start and end of play,
 - d) Amount gambled including any multipliers (e.g.: number of lines played, and cash / credits bet per line),
 - e) Total cash / credits won for the prize resulting from the last play (including progressive jackpots),
 - f) Any customer choices involved in the game outcome, and
 - g) Results of any intermediate game phases, such as gambles or feature games.

2.1.11 Game Disable

1. It must be possible for the operator to disable any game or game session without any unfair impact on the customer.
2. The operator must provide full audit trails when disabling a game that is currently in play.

2.1.12 Incomplete Games

1. Where a game can have multiple states, or stages, (multi-state), the system must provide a method of the customer returning to the incomplete game to complete it.

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2. The operator must provide a mechanism for a customer to complete an incomplete game before a customer is permitted to participate in any other game. Incomplete games may occur as a result of:
 - a) loss of communications between operator and end customer device,
 - b) operator restart,
 - c) game disabled by operator,
 - d) end customer device restart, and
 - e) abnormal termination of gambling application on end customer device.
3. Gambles associated with a partially complete game that can be continued must be held by the operator until the game completes. Customer accounts must reflect any funds held in incomplete games.
4. The operator must ensure customer fairness, to the extent possible, in the event of a communication loss to one or more end customer devices during a multi-customer game.
5. Game rules must cater for situations where the operator loses connectivity with the customer.

2.1.13 Multi-Customer Games

1. Multi-customer games (e.g.: Poker) with outcomes that can be affected through collusion between customers must contain functionality and enabling technology such as clear rules, compensating controls and other technology to minimise the risk of cheating (some of the controls to detect and prevent collusion will be operational controls outside the scope of game software).
2. Multi-customer games with outcomes that can be affected through the use of automated electronic devices or ancillary computer systems must have warnings in the game rules so that customers can make an informed decision whether or not to participate.

2.1.14 Peer to peer Games

1. Where operators use programs to participate in gambling on their behalf in peer-to-peer gambling (e.g. “robots”), information must be displayed, which clearly informs customers that the operator uses this kind of software.
1. Where peer-to-peer(s) customers may be gambling against programs deployed by other customers to play on their behalf, information must be made easily available that describes that this is possible.
2. This information must warn customer of the risks of gambling against robots and of using robots themselves, that is, that the predictability of robots may be exploited by other customers.
3. If it is against the operator’s terms and conditions to use robots, information must be made easily available on how to report suspected robot use.
4. Customers must be informed where performance characteristics of networks or end-user devices may have, or may appear to have, an effect on the game, such as the display of progressive jackpot values.

2.2 Mapping & scaling

Any scaling applied to the output of the random number generator must maintain the qualities outlined in section 2.1 of the randomness standard.

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2.3 Use of random numbers

When random numbers, scaled or otherwise, are received, e.g. following a game requesting a sequence of random numbers, they are to be used in the order in which they are received. For example, they may not be discarded due to adaptive behaviour.

Numbers or sequences of numbers are not to be discarded, unless they fall outside the expected range of numbers required by the virtual event – such an occurrence should result in an error being logged and investigated.

2.4 Monitoring game output

Where required the game or system should monitor the game output on a defined periodic or volume basis. The purpose of monitoring is early detection of abnormal behaviour enabling timely appropriate remedial action. Any abnormalities (e.g. the actual RTP for the period falling outside the expected range) should result in an error being logged and escalated for investigation.

3. Testing process

Game fairness testing conducted by the independent testing laboratory must follow the following minimum scope of testing.

3.1 Scope of testing

Scope should include all of the following:

- a. **Maths review** - verify the manufacturer's par sheet and game rules and confirm that they correspond with each theoretical RTP as stated;
- b. **Game rules** as presented to the player are in accordance with maths and easy to understand;
- c. **Software implementation** accurately reflects the game rules. This was tested by:
 1. Source code review of pertinent modules relating to payable and rules;
 2. Simulation⁴ (output) testing for x games;
 3. Manual⁵ game play using consumer game client(s); and
 4. Emulation to replicate certain rare game outcomes (such as jackpots, infrequent features and maximum prize);
- d. Scaling and mapping of RNG output;

3.2 Integration testing

The accredited testing organisation shall be particularly aware of the fact that, even if the supplier's product has been certified already, it may be necessary to repeat parts of the certification, when the product is integrated into the licence holder's overall gambling system. This will be particularly relevant when the implementation involves changes to the certified product.

3.3 Update testing

Section 5 details what type of changes to already tested product would require retesting. The scope of any retest will depend on the change. It is accepted that testing of changes to previously certified product is usually a subset of full game testing.

⁴ Simulation (output) testing - Setting the game up to play automatically for a high number of games (actual number will depend on volatility of the game as per the maths) to then verify that the *actual* RTP is within acceptable range of the *expected* RTP. Sample data should be tester generated, unless supervised in a controlled environment for the purposes of meeting specific regulatory requirements. Software modified from the original to enable rapid play is permitted providing the tester has confidence that the modifications do not impact on the assessment of game fairness.

⁵ Manual game play - actually playing the game to verify all activity observed works as expected (e.g. playing a game for one hour would allow the tester to see most of the common prizes and determine whether pay lines are implemented correctly etc)

4. Game fairness testing reporting

Game fairness test reports should be in a standardised format so as to enable vendor-to-vendor and tester-to-tester comparisons and to enable the regulator to clearly see the scope of testing.

The purpose of the following isn't to mandate the format of a test report, it is to outline the minimum elements to be contained within reports. How the lab selects to display the information is up to them (in table format, different order to that outlined below etc), so long as all the minimum information is present.

4.1 Test laboratory details

Contact details of test laboratory, physical location(s) where testing was performed, date(s) of testing including any resubmissions required and certificate reference number – certification signed off by test supervisor.

4.2 Executive summary

4.2.1 Introduction

Introduction about the supplier, system (online casino, poker, lottery) utilising the game, jurisdiction(s) and applicable compliance standards/requirements (including date and version).

4.2.2 Description of game

Briefly describe the game and its use in the gaming/lottery system.

4.2.3 Scope of testing

Outline the scope of testing conducted, as per that listed in 3.1.

4.2.4 Limitations of use of software

Any limitations on the use of the game should be cited. Details of the system / platform / RNG game was tested on and for which certification is valid for.

4.2.5 Conclusion

Conclusion of evaluation – game complies, or game complies under certain conditions.

4.3 Detailed test results

4.3.1 Test methodology

NOTE: This section will elaborate on the scope of testing as per 3.2.3 and detail the tests performed (referencing any test scripts utilised by the test lab) and the results of each test.

Complete the table below using the following column values.

| | | |
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Req No. Compliance requirement number

Req Description. Description of the compliance requirement

Compliance Status Comply/Does Not Comply/Not Applicable/Out of Scope

Comments Describe how game complies with the compliance requirement OR why the game does not comply OR why the compliance requirement if not applicable OR why the compliance requirement is out of scope

| Req No. | Requirement Description | Compliance Status | Comments |
|---------|-----------------------------------------|-------------------|----------|
| 2.1.2 | Information about the rules of the game | | |
| 1 | Rules are easily available | | |
| 2 | | | |
| 3a | | | |
| 3b | | | |
| | | | |
| | | | |
| | | | |

4.4 Identification of software

Include the following information about the game evaluated in this section.

4.4.1 Software

Manufacturer / Supplier:

Software identification number and version as designated by manufacturer:

Language of implementation (C++, Java, etc.):

File names and industry standard secure hashes

List hashes of source code files and binaries of the software evaluated.

For game software, include hashes of the code for the critical files. Critical files are those defined as something that can impact on the integrity of the game fairness components.

Platform and test equipment information:

NOTE: Sufficient information should be contained in the test report to verify that any live instance of the game accurately reflects the tested version. This would include the file names and hashes of source code and executables, all critical files as designated by the developer and tester must be listed. In addition to the core game any pertinent operating environment details must be listed such as the operating system, RNG, gaming platform and other environmental variables that if modified could impact on the test certificate results.

4.5 References

List of documents used for reference (compliance requirements, literature/URLs, more detailed description of game / rules, supplier's documentation, etc.)

1. Ref 1
2. Ref 2
3. Etc

4.6 Annex A – statistical testing results (if applicable)

Describe the statistical tests carried out and the results.

5. Game updates

This section deals with the testing expected when updates are performed to an existing (previously certified) game. Outlined below are a set of high level principles along with a table which gives some lower level examples and definitions. This section also outlines the expected internal controls to cover game software development and change management.

5.1 Game update principles

Updates to previously certified games which impact (directly or indirectly) game fairness or return to player are considered higher risk updates. Conversely, updates which have no influence over game fairness / RTP would be considered lower risk. It is expected that all higher risk updates are retested by the independent testing laboratory which tested the original game (this is desirable as the effort for retesting is greatly reduced if the same lab performed the original full game test). Game fairness / RTP in this context refers to the underlying maths and design of the game (pay tables, symbol distribution, feature rules etc) and how the software has implemented the game rules. Collectively the game rules determine the overall game RTP.

5.2 Game update examples and risk rating table

*Note that these are examples only and thus may include but are not limited to the following

| Game client changes (Client = Front end, player interface to game. Software that usually resides or runs on the player's device and interacts with the game engine. E.g. Native phone app, web browser HTML 5, Flash implementation) | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Example changes likely to be of higher risk | Example changes likely to be of lower risk |
| <p>1) New client developed in a different technology for an existing game (e.g. Game client was originally tested and released on Flash technology but operator wishes to offer the game client in a newer technology such as a native app or HTML 5);</p> <p>2) Change the way a client communicates with the game engine. E.g. a client is 'wrapped' with an intermediary software layer which translates communications to a different backend platform / game engine.</p> <p>3) Clone game. New game title and outward appearance but the underlying game logic and rules is based on a previously certified game. Nb. Although higher risk the testing required for this would be minimal. Refer to (5.3.1).</p> <p>4) New feature game. E.g. replacing the 'free games' feature with a 'pick the box' feature. This changes the rules and is likely to change the engine. Would be considered a new game.</p> | <p>5) Player user interface aspects affecting look and feel of game play (e.g. screen rendering of certain animation, or button not displaying correctly);</p> <p>6) Updates to the player facing rules / artwork. Not to change the game but to add subtle improvements to what the player sees, such as clearer rule descriptions;</p> <p>7) Reskin. Linked to clone games point 3 but game name and operation does not change. Update is only to the look of the game (e.g. casino branding)</p> <p>8) Client change of connection target. 'address' change of where the client connects to the game engine server;</p> <p>9) Client change to accommodate underlying operating system update. E.g. iOS update requiring app to be updated to continue to operate.</p> |

Game engine changes (Engine = Back end, game server, contains the critical game elements – rules, pay tables, symbol distribution, feature operation, RNG interaction)

Example changes likely to be of higher risk

- 10) **Integration of an existing game onto a new platform.** Where a game is moved onto a new platform (e.g. new hosting platform) it is likely to be re-coded for the new technology and possibly RNG. This is a high risk for both the engine and client.
- 11) **Update to correct a fault in the software rules implementation.** E.g. Game was not operating as designed due to an error in coding which affects the RTP. May or may not require a change to the client;
- 12) **Change to how the engine processes critical functionality.** Even if the change does not alter the RTP. E.g. The way the game engine calls the RNG or how it stores the reel strip symbol distribution;
- 13) **Engine update to accommodate more lines.** Sometimes core engine functionality will accommodate games with different line configurations. Where an engine is updated to accommodate new line types not originally tested this is a higher risk. Nb. May also impact previously tested games.

Example changes likely to be of lower risk

- 14) **Adding / changing backend reporting features.** E.g. New accounting reports for the game performance. Nb. If altering core game transaction logging this may be higher risk;
- 15) **Change to accommodate an Operating System patch or update.** E.g. New feature available in iOS or Windows that the game engine utilises. Nb. If change relates to critical game functionality this would be higher risk.

Table footnotes

5.2.1 New 'clone' games

This might be termed a type of reskin. It is a new outward looking game (new game title and graphics and artwork) but the underlying game rules and software implementation is based on an existing game. Therefore the amount of testing required is minimal, testing would only be required to confirm that the changes relate to the look and graphics and not the underlying game rules.

As this appears to be a new game however it would require sufficient evidence which demonstrates its relation to the game it is based on. This would likely be in the form of a new test report which contains the comparison work performed, the clone game's particulars and references the previously certified game it is based on.

5.2.2 Updates to an RNG, RGS or other core game engine functionality

Updates to an RNG or Remote Gaming Server (RGS) which serve or hosts multiple games can affect the fairness of those games. Similarly where an update is performed to core game engine functionality which is utilised by multiple games this too may impact on the fairness of those games. In such circumstances it can be disproportionate to re-test all of the served games. A proportionate approach would be to test a representative sample of the affected games to confirm the operation of the entire game set is not harmed.

5.2.3 Games with multiple RTP variations

Software changes which result in a new RTP would be considered high risk and require retesting. However where a game was originally built and tested with multiple configurable RTP percentages then changing the RTP in operation would not require retesting. (ie. So long as the maths and operation of the available RTP variations have all been verified by a testing laboratory then that game would be considered certified for each available RTP variation). Nb. Different jurisdictions may have requirements around the ability to run a game at different RTP variations.

5.2.4 Progressive jackpots

Where a game is connected to a progressive jackpot system there must be strict controls and audit logs governing any changes to the parameters or prize pools, as this affects the RTP. Where a jackpot is decommissioned any remaining player contributed funds must be returned to players. This can either be the actual players who contributed the funds or a similar player base (for example the money could be added to a different progressive jackpot system). Adequate player disclosure must accompany any approach.

5.3 Software development and change management

Updates performed to critical gambling system components⁶ have the potential to affect the fairness and integrity of gambling. It is therefore expected that licensees develop and conform to a change management framework. The below requirements represent a high level overview and will generally be considered acceptable by jurisdictions participating in this scheme. Though it must be noted that certain aspects of change management and product certification will be specific to a jurisdiction's regulatory requirements. Therefore licensees are expected to ensure any gaps between this framework and the requirements of any participating jurisdiction the operator is licensed in are adequately addressed. I.e. Licensees must ensure they comply with all relevant requirements with regards to any pre-release or ongoing testing certification, regulatory approval and evidential documentation.

⁶ Critical Gambling System Components include game and RNG software / hardware and the underlying remote gambling system which supports the above.

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5.3.1 Development process

- source code should be held in a secure environment
- an audit log of all accesses to program source should be maintained
- old versions of source code and the dates they were retired should be retained
- access to source code by developers should be well controlled and based on a minimum access required for the job approach
- Source code should be accompanied by appropriate technical documentation suitable for independent review
- all source files should contain sufficient commenting to explain file/class/function purpose
- source code should be sufficiently legible and structured to permit static code analysis and for the review of its functionality to be conducted with confidence
- write access to platform source code should not be granted to those working only on game specific development
- changes to critical modules need to be peer reviewed by appropriately skilled but independent staff to ensure all changes made are appropriate and in line with the change documentation. Any suspicious or unauthorised changes must be explained.

5.3.2 Testing process

- logically separate development and testing environments
- separate staff to those that developed should perform the testing (in an agile development environment testing staff may be within the same team as developers testing iteratively alongside them)
- an independent assessment of changes made by the developers should be performed to verify all changes are documented in the change documentation. This may involve the use of file comparison programs to quickly identify all changes.

5.3.3 Change management

All game and critical system changes should be supported by a change management plan which should:

- be documented
- be managed by someone with the necessary proficiency and expertise to oversee the change and make decisions
- ensure adequate testing, change control mechanisms and authorisations are in place for the software migration into the operational environment.

Accompanying any RNG/game change, the change documentation must record:

- unique change ID
- game or RNG identifier / version
- delivery channel(s)
- description of change
- change classification (high / low risk - refer to 5.2)
- justification for the above classification
- description of how the change shall be certified (ensuring relevant internal and external testing is outlined)
- relevant manager's authorisation for change
- other particulars as required by the licence holder's / relevant regulator's internal change management requirements.