Queensland Fireworks Product Safety Sampling and Test Standard

Edition 1

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Preamble

The overall purpose of this standard is to improve the level of safety when fireworks are used and handled in Queensland for public displays. These fireworks are to be used by competent operators under rules as set out in the Code of Practice - Control of Outdoor Fireworks Displays

The code of practice requires that:

- *Fireworks must be supplied at a recognised safety performance level and supported with appropriate documentation***.**
- *An authorised seller has a duty of care obligation to ensure that a sample of all fireworks supplied has been tested in accordance with a recognised quality standard or code of practice and certified to be of acceptable quality and met the safety and performance requirements of that recognised standard or code of practice.*
- *The seller must provide a current certificate of compliance to the purchaser for the fireworks being supplied. The purchaser must not accept the fireworks or supply those fireworks to another person (e.g. the fireworks operator) without a current certificate of compliance. The certificate of compliance must detail the standards and performance to which the fireworks comply.*

This standard sets the framework within which testing is to be carried out, the criteria against which the fireworks will be assessed according to their safety performance, as well as the tests that have to be conducted to ensure that the necessary criteria are satisfied.

When a report on testing is issued it will make a statement with regard to nonconformities determined during the testing. The report on its own does not constitute a statement with regard to safety compliance certification. The standard sets the level of compliance and the report certifies compliance with the standard. All reports must therefore be read in conjunction with this standard.

The requirements as set out in this standard, the proposed sampling plans, the evaluation criteria and reports have been arrived at though the contribution and involvement from, testing facilities, fireworks contractors and operators, importers, manufacturers, sellers and regulatory bodies.

1. Introduction

Display fireworks are firework articles suitable for use at public displays according to the Code of Practice - Control of Outdoor Fireworks Displays (hereinafter referred to as the Code of Practice)

This Standard aims to provide the criteria according to which fireworks intended for display are sampled and tested to ensure an acceptable level of safe performance.

It is based largely on AS 2187.3-1998 but has incorporated aspects of BS 7114, *Fireworks*, and the Canadian Draft Fireworks standard with some contributions from the American Fireworks Standards.

It incorporates criteria that can be used to assess a failure mode for performance but does not always specify performance criteria that should be met against which safe performance can be assessed.
The issues that could lead to an increased risk when using any firework can broadly be stated to be,

- Prior handling of firework leading to unsafe operation of the device
- Initiation of firework leading to unsafe or unplanned timing of the operation of the device
- Operation of firework leading to unsafe or unplanned outcomes from the device
- Residue, results or remnants from the normal operation of the device leading to unsafe or unplanned conditions that could be hazardous to the public or the operators.

In devising this standard, the tests and processes are directed at the predetermination of the probability of the occurrence of such issues.

The output from the testing may also provide the users with enhanced information with regard to the firework. With this purpose in mind information with regard to the performance of fireworks, although not pertinent to the acceptability of the firework, will be supplied to the seller who could pass the information on to the user.

2. Scope

This Standard sets out requirements for the safety performance and testing of fireworks as defined in the Code of Practice.

This standard should be read in conjunction with Queensland Fireworks Product Safety Code

The Standard does not apply to-

- indoor theatrical and film set special effects ;
- distress signals flares;
- model rocket motors;
- unrestricted fireworks; or
- storage, transport or use of fireworks
- prohibited fireworks as defined in Queensland Code of Practice Appendix 2, (A2.1)

This standard does not provide for the validation of the accuracy of the Technical Information that is supplied with the fireworks.

This standard does not provide for the validation of the accuracy and contents of the Material Safety Data Sheets.

This standard does not provide for tests that would include the disassembly of a firework or part thereof.

3. Referenced documents

The following documents have been referenced and used in the drawing up of this standard.

Parts of these documents are presented in the definitions and appendices of this standard

Queensland Code of Practice - Control of Outdoor Fireworks Displays
Queensland Fireworks Product Safety Code
AS 2187 Explosives—Storage, transport and use
AS 2187.0 Part 0: Terminology
AS 2187.3 Part 3: Pyrotechnics-Shop goods fireworks-Design, performance and testing
AS 2187.4 Part 4: Pyrotechnics - Outdoor Displays
Canadian Draft Fireworks Standard
BS 7114, Fireworks
NFPA 1123 Code for fireworks display
AS 1199 – 2003 parts 0, 1 and 2. Sampling procedures for inspection by attributes.

4. Definitions

For the purpose of this Standard the following definitions shall apply;

- Definitions given in AS 2187.0 and AS 1199 will apply
- Definitions as per the Queensland Code of Practice - Control of Outdoor Fireworks Displays
- Definitions given in the Queensland Fireworks Product Safety Code will apply

Where there is a conflict or ambiguity in the wording of a definition the following preference hierarchy of meaning will be used.

1. Specifically Defined in this document
2. As defined in the relevant Acts or Regulations
3. As defined in the referred Australian standards
4. As defined in other relevant codes of practice

5. Requirements general to all fireworks.

5.1 General

To reduce the risk of unsafe and/or unplanned occurrences fireworks must be designed and constructed to be safe during handling, storage, transport and use.

Only fireworks with a known safety performance and demonstrated compliance with this standard may be supplied to a fireworks contractor, fireworks seller or user.

The fireworks must be properly identified, packaged and classified and must have suitable safety and performance data provided with it. Each firework will have a unique identifier on it that can be used to track it from time of manufacture to the point of operation.

The Code of Practice requires that the following must be considered:

- the chemicals used within the firework;
- the robustness of the firework (including the capability of the construction materials to resist damage and to avoid leaking the composition of the fireworks under normal conditions during transport and handling);
- the compatibility of the firework with the equipment being used;
- unplanned or uncontrolled explosions; and
- any other feature that presents an unacceptable risk to the health and safety of any person.

The fireworks shall be designed to function in a safe and predictable manner.
To accomplish this, consideration shall be given to:

(a) ignition method and fuse burning time;
(b) pyrotechnic content and composition;
(c) construction type and integrity;
(d) performance of the firework;
(e) debris characteristics;
(f) size of the area affected during the functioning of the firework; and
(g) the fire and health risks posed by the firework.

This standard addresses all of these issues except the determination of the composition and health risks. The way that the composition type and quantity affects the safety performance will, however, be assessed by test firing and evaluating the limits of the fireworks effects.

5.2 Information to be provided with firework.

Technical information shall be provided to the testing facility for the safe use of the firework. This information, intended for the user will describe the way in which the firework functions and will enable end users to select fireworks appropriate for their needs as well as to take the necessary precautions to ensure the safe operation of a firework during any display. Such information shall be easy to comprehend and shall be legible. Instructions shall be in English.

This standard does not set out to verify the information in such technical data sheets.

Information relevant to the drawing up or alteration of such data sheets will however become available from the test report supplied to the owner of the firework being tested.

5.3 Construction

Fireworks shall:

(a) be constructed so that no pyrotechnic composition can escape during normal handling prior to use;
(b) be designed in such a manner that they are not likely to cause injury or damage when used in accordance with the instructions (Technical Data Sheets) provided;
(c) be designed and constructed so that, upon ignition, the firework case(s) does not rupture except for types designed to do so, such as aerial shells, mines and crackers;
(d) be constructed so that the leader fuse safety cover is easily removed without dislodging the leader fuse from the firework (where relevant); and,
(e) be designed and constructed in such a manner that when fired, no damage is caused to the equipment used to hold, contain or direct the firework.

5.4 Pyrotechnic content

The explosive content and expected range in weight for Hazard Division classification and net explosives quantity (NEQ) calculations should be validated.

As the disassembly of fireworks falls outside the scope of this standard the method of verification of NEQ will be based on a comparison of original and residual weight of the device.

In the case of devices that are completely destroyed during their operation (eg, aerial shells, salutes etc.) a standard predetermined factor should be used.
The precise method of determining the NEQ will be left up to the testing facility but it should be documented in a standard procedure to ensure consistency of the results obtained.

5.5 Ignition method and timing

The ignition method shall be readily identifiable and shall be by an appropriate method as recommended by the manufacturer or supplier or by prevailing good practice.
The time elapsed from manual lighting (using a portfire) to functioning shall be sufficient to allow the user to retire to a safe distance but not so long that it may appear to be a misfire.

This time delay shall also apply to the time elapsed between the functioning of successive elements of the firework

Fireworks designed to be ignited by manual means shall:

(a) discharge not less than 3 seconds and no more than 10 seconds after lighting; and
(b) have a maximum delay between cessation of one tube or effect and the firing of the next tube or effect in a combination or multi-tube firework of five seconds.

Fireworks supplied prefused with an electric fusehead shall discharge not more than 10 seconds after ignition.

All fireworks, unless specifically fitted with an electronic means of ignition, shall be deemed to be suitable for manual firing and tested accordingly with regard to the time periods required.

5.6 Performance

The performance of fireworks shall be such that competently trained and authorised persons following standard accepted practice are not, as far as practicable, exposed to the risk of injury, nor should property be exposed to damage, nor should any member of the public be endangered while observing the display from outside the mandated Minimum Safety Clearance Distance for the firework being tested.

The safety performance of any firework is assessed by the test firing of unaltered fireworks used in a similar fashion as during a display. The actual performance of the fireworks is assessed and measurements taken.

Acceptance or rejection is dependent on the levels for nonconformities as set out in Appendix 5

Measurements not pertaining to safety performance or relevant to non-conformances shall also be taken during the test. The results of these measurements could be used to assess the overall performance of the device and / or can be used to provide the supplier with additional technical information regarding the specific device. Such information could for instance be used to specify enlarged clearance distances.

If, in the opinion of the testing facility, the overall safety performance of the firework is considered to be suspect, even though insufficient critical non-conformances were found, then this fact must be reported to the persons that requested the test to be conducted.

6. Requirements for conducting of tests.

6.1 Risk assessment and safety plans

Each testing facility should have a set of safety management plans for the conducting of testing. Risks at such a facility could be significantly higher than at a display and the safety management plans should reflect this.

A copy of the risk assessments and safety management plans should be kept at the facility. The testing procedures used to test the fireworks should incorporate the findings of the risk assessment and the requirements of the safety management processes.

It should be noted that the testing of fireworks, although done under very similar conditions to that of a display, is not a display, and the public should be kept away from such testing. The clearance distance for people not involved with the testing should be increased.

6.2 Testing equipment

The specific equipment required to conduct a test is left up to the discretion of the testing facility.

Not withstanding the fact that the choice of specific equipment is left to the discretion of the tester, documented procedures for the use of the particular equipment, and how they are used to determine the values, should be kept readily available by each testing facility.

It is recommended that equipment should be available to measure the following outcomes of a test.

- The **height** or elevation that was reached by any firework to within an accuracy of five meters
- The **weight** of any part or whole of a firework with an accuracy of not less than 1 gram.
- The **timing** of any part of the firing sequence with an accuracy of not less than 0.1 seconds.
- A method to visually record the **operation** of the firework for the entire duration is highly recommended. This method should be able to store the information in a permanent format for later reference by any party like the owner, manufacturer, user, inspectorate etc.
- The visual record should be of the close up operation of the firework and could include an overall view of the firework if the situation requires it.
- Equipment to measure the dimensions of the fireworks and components to an accuracy of not more than 1 mm.
- Methods to store and recall all visual information when so required.
- Equipment to measure distance (within 1 meter) for measuring location of fallout, debris or dud components from point of launch.

6.3 Testing competencies.

The facility or person that conducts the tests should be authorized to do so in terms of section 9.1 of the *Queensland Fireworks Product Safety Code* and hold a certificate to test the compliance of fireworks to the *Queensland Fireworks Product Safety Code.*

Persons conducting the test should be competent to do so in terms of the *Queensland Fireworks Product Safety Code.*

The person in charge of the tests being conducted should have an authority to use fireworks to ensure the safe use of fireworks at the test facility.

The persons conducting or assisting in the test should be familiar with the testing equipment used to ensure that accurate measurements are taken.

The person in charge of the testing shall be competent in testing fireworks and in applying the requirements of this Standard.

All persons involved in the testing procedure who do not hold a fireworks operators licence should be suitably trained to ensure the safe and accurate operation of the tests.

6.4 Testing environment

The following is deemed to be the recommended minimum requirements for a test environment.

(1) Testing ground.
Dimensions of the testing ground to allow adequate clearance distance, as per the Code of Practice, or as approved by the Chief Inspector of Explosives. The test ground should be predominantly flat with minimum obstructions, such as trees, to ensure good visibility. Grass around the central sand filled surround area should be kept as short as possible so as not to present a fire hazard.

(2) Testing ground security.
The perimeter of the testing ground should be easily identifiable and warning signage placed at regular intervals on the perimeter line while testing is in progress. The perimeter should be in clear view of testing officers so that perimeter security can be maintained and any unauthorised entry into the testing ground prevented or quickly noticed and managed.

(3) Test firing pad.
The test-firing pad should be located at the approximate centre of the testing ground. It shall be a flat, smooth finished surface allowing the fire works to be aligned in a vertical plane. It is recommended that a concrete slab be used which would allow it to be fitted with suitable anchors or hold down points for any special jigs or tools used to locate and align fireworks during test firing.

(4) Sand or soil filled test pad surround.
An area 20 metres in diameter surrounding the test-firing pad shall be cleared of grass and covered with sand or loose soil to a minimum depth of 100 millimetres or grass kept short enough to allow detection of debris. This area allows the set-up of items that cannot be fitted to the test pad anchor points, or require other means of fixing to ground e.g. staking as well as for the easy detection of debris falling out within close proximity.

(5) Protected observation/firing shelter.
A protected shelter shall be provided to house personnel and equipment, to be located 20 metres (minimum) from the centre of the test-firing pad. It is recommended that the shelter shall consist as a minimum of three walls and roofing. The wall facing the test-firing pad shall contain a viewing window to allow the testing officer a clear and un-obstructed view of the firing pad. Both wall and window shall be constructed in such a manner to resist the effects of any possible firework malfunction. The method of construction and materials used shall be determined by individual case risk assessment.

(6) Observer's locations.
A location for the observer is to be defined and shall, for each firework tested, be located on the periphery of the specified clearance distance of the firework under test. This location shall provide a clear and un-obstructed view of the firing shelter, test-firing pad, anticipated entry points to the testing ground, and should be located to best suit local conditions e.g. seasonal variations in sunlight direction. This location would allow the observer to note if any part of the firework goes outside the clearance distance in the direction of the observation point where he is situated.

(7) Storage of fireworks at the testing ground.
A fireworks storage magazine that complies with AS2187.1 and the Queensland Explosives Regulation 2003 and is licensed by the Chief Inspector of Explosives to store a minimum of 200kg NEQ minimum shall be located on site. The magazine shall be located outside the testing ground perimeter, separation distance to be in accordance with AS2187.1 or as approved by the Chief Inspector of Explosives.
Suitable carrying containers must be available to transport to, and temporarily store the fireworks at the firing point.

6.5 Other requirements for testing.

- Firework initiation.

All fireworks tested shall preferably be initiated electrically by firing panel and electric fuse head. The electric firing system shall comply with AS2187.2 Section 6, and Appendix B.
The method used for linking the fuse head with the device will be left up to the testing facility but should be done in a documented standardised fashion. Electric firing allows personnel to be safely located remotely within the observation/firing shelter and provides increased levels of control and better time measurement techniques.

- Testing personnel.

A minimum of two testing officers is required to safely operate the testing ground, the operator and an observer. During test-firing the operator is located in the observation/firing shelter and the observer at the observer's location on the periphery of the test area.

- Weather conditions.

Fireworks shall be test-fired only on dry days and with wind velocities less than 15km/hr.

- A suitable venue should be available to allow physical measurements to be taken.

This venue should be conveniently close to the magazine in which the fireworks are stored. However this venue shall not be inside the magazine or be in clear line of sight of the inside of the magazine when the magazine door is open.

7. Testing of fireworks.

7.1 Design and construction.

All fireworks submitted for testing will be inspected to see if they comply with the structural and design characteristics as set out in Appendix 3 and with specific reference to the robustness of the firework and the compatibility of the firework with the equipment being used. The testing will include consideration of the capability of the construction materials to resist damage and to avoid leakage of the composition of the fireworks under normal conditions during transport and handling. Where dimensions and tolerances for compatibility are determined it will done against a standardised size similar to the stated size or calibre of the firework.

7.2 Labelling

All fireworks will be inspected to see if they comply with the labelling requirements as stated in Appendix 2. Fireworks that do not conform to the labelling requirements will be rejected and returned to the supplier who presented them for testing without any further testing or measurement having been done.

7.3 Measuring of physical properties and construction

Measuring and inspection of the physical properties and inspection of each individual firework submitted, as a sample will be conducted to provide the information as required in Appendix 3. Fireworks that do not conform to the physical and structural requirements will be returned to the supplier without conducting any performance testing.

7.4 Performance tests

Testing of fireworks will be done under the stipulations of the Code of Practice and under the requirements of Queensland Fireworks Product Safety Code. The tests will primarily be directed at ensuring the safety characteristics of the fireworks lot as represented by the sample supplied to the testing facility. Tests will be conducted by firing the fireworks individually under controlled conditions and by determining the number of items that show non-conformity.

7.5 Additional performance tests

Whenever circumstances occur which may affect the performance of the fireworks that have already been tested, it may be required that the fireworks are subjected to further testing. The following are some of the conditions that may affect the performance of the fireworks:

(i) Stored fireworks can suffer from moisture absorption or desiccation.
(ii) Climatic changes caused by transporting fireworks from a temperate to a tropical climate can adversely affect their performance.

(iii) Fireworks packaged under conditions of high humidity can become wet if high temperatures or direct sunlight cause evaporation of absorbed moisture followed by its subsequent condensation on the inside of packages, leaving water droplets capable of affecting the firework.

(iv) The outer packaging or carton shows signs of damage. These conditions will have an influence on the way the fireworks operate safely and their effect can be determined through safety performance testing in a similar fashion to fireworks that are tested for the first time.

There is also provision for additional performance tests when the result of a test is appealed against, by the manufacturer, importer or supplier.

When fireworks have to be tested again they will be tested according to the same sampling plan as when they were tested originally. Only in the case of testing following an appeal due to non conformances having occurred will a tightened inspection regime be used.

8. Sampling (inspection) of fireworks for testing.

8.1 Introduction

Sampling will be done in accordance with the Australian Standard AS 1199 –2003

The sampling variables.

- The intent is to test a representative sample of all fireworks destined for use in Queensland as all fireworks to be used in a display must have been tested for safety performance. Therefore the first determinant of the sample is that it should **represent fireworks** in the consignment intended for use in Queensland.

- As it would be difficult to identify those separate items in the overall consignment, usually a full shipping container, that would be intended for Queensland it is thus practical that the consignment is enlarged to include **all of the fireworks that are in the container**. The importer can however specify that certain fireworks are not for use in Queensland and exclude these from being tested.

- The different fireworks in a container would significantly differ in nature and performance the next determinant would thus be **the type and size of device**.

- The performance of fireworks is determined by their chemical composition, which in turn is reflected in the effect and colour. **The effect and colour** is taken as the fourth determinant.

A group of fireworks of unique characteristics that is submitted for testing, the results of which will determine the acceptability of all similar fireworks in the consignment is called a **lot.** The **sample** or inspection sample is that group of items drawn from the lot for testing that will represent the whole lot. The certificate that will be issued will address each lot individually.

A “lot” that has to be sampled will thus have uniquely the following characteristics and will be identified as such:

- Firework type (Aerial shell, Multi-shot cake, roman candle, etc)
- Firework size or assembly (3” 4”, 100 shot, 12 shot etc)
- Firework effect (Red peony with tail, white chrysanthemum to yellow)
- Date of manufacture, arrival, manufacturer’s identification number or container identifier. (12 / 4 / 89 or container number XXXX with waybill number)

In effect a container will thus consist of a group of “lots” each of which will have to be sampled and tested. It can further be assumed that the size of each of these lots would vary but that the sampling should be such that a sample of sufficient size to provide adequate representativeness is drawn from each of these lots.

8.2 Principles

There are certain underlying principles from AS 1199 - Sampling procedures for inspection by attributes that are used in this standard as well.

Aim of sampling inspection.

A major aim of sampling inspection is to see that the (fireworks) *producer submits lots at a quality which is at or better than a mutually agreed level.*
The agreed level is determined by, the unacceptable performance, and the acceptable level of this unacceptable performance occurring. The importers and manufacturers and the users of the fireworks should agree to this level and the criteria that determine it.

Acceptance sampling

Acceptance sampling inspection has the merit of putting the responsibility of quality fairly and squarely where it belongs- with the producer.

Choosing between the attributes and variables inspection

The attributes method of inspection consists of examining an item or characteristics of an item and classifying the item as conforming or non- conforming. The action taken (to pass or fail an item) *is decided by counting the number of non- conforming items or the number of non-conformities found in a random sample.*
If sufficient unsafe malfunctions / safety defects of the fireworks occur during the testing of the sample then the lot is deemed to be unacceptable.

The variables method start with selecting a sample of a number of items and measuring dimensions or characteristics so that information is available not only on whether a dimension, for example, is within certain limits but on the actual value of the dimension.
Part of the test process will include variable inspections. Aspects like the NEQ (or an approximation thereof), the weight, dimensions, height that a device reaches etc will all be actually measured and recorded and then compared to what is required or stated by the producer.

In the testing of the fireworks, inspection by attributes will be used for safety performance and variable inspection for dimensions and some performance parameters. When variables testing is conducted it will be non-destructive in nature. The testing of fireworks for safety performance attributes is destructive in nature.

Lot size

Notwithstanding the advantages of having larger lots to sample from there are practical considerations. The main difference between the method of sampling usually used and that which will be used for testing fireworks is that the lot size will be determined by the number of articles that is intended for use in Queensland that is within the consignment sent.
Sampling and inspection according to this standard can be performed in any Australian state or territory and the fireworks then acceptable for sale in Queensland.

Lot-by lot inspection

Lot- by- lot inspection is the inspection of a product submitted in a series of lots.
The way that the fireworks will arrive in Queensland and be submitted for testing makes it a typical lot-by lot inspection method. Through the comparison of the results of similar types of fireworks in subsequent lots trends with regard to quality will be able to be determined. This could lead to a more relaxed or stringent sampling regime. It will ultimately lead to better protection for the consumer.

Acceptable quality level (AQL)

The AQL is a chosen borderline between what would be considered acceptable, as a process average and what would not. As such, it in no way describes a sampling plan, but is a requirement of what the production should be like and is a useful quantity to consider in defining a tolerable process.

Practically the AQL is the level of non-conformances that will be tolerated in a sample before the lot is rejected.

8.3 Sampling of the Submission

The following table sets out the number of samples to be submitted and the accept- reject criteria for the various circumstances.

The Accepted Quality Level (AQL) is specified to be 4 %.

Table 1 – Sampling Plan

Size of lot submitted for testing	Number of articles to be sampled			Acceptance		
	Products from companies* with no past difficulties:	Products from known companies with some past difficulties	Products from unknown companies Or tests on appeal.[1]	Maximum Number of Failures		
Inspection level and level as per AS 1199	S2 Reduced	-I Normal	III Tightened	**S2**	**I**	**III**
2 to 8	**2 (A)**	**2 (A)**	**3 (B)**	**0**	**0**	**0**
9 to 15	**2 (A)**	**2 (A)**	**5 (C)**	**0**	**0**	**0**
16 to 25	**2 (A)**	**3 (B)**	**8 (D)**	**0**	**0**	**0**
26 to 50	**3 (B)**	**5 (C)**	**13 (E)**	**0**	**0**	**0**
51 to 90	**3 (B)**	**5 (C)**	**20 (F)**	**0**	**0**	**1**
91 to 150	**3 (B)**	**8 (D)**	**32 (G)**	**0**	**1**	**2**
151 to 280	**5 (C)**	**13 (E)**	**50 (H)**	**0**	**1**	**3**
281 to 500	**5 (C)**	**20 (F)**	**80 (J)**	**0**	**1**	**5**
501 to 1200	**5 (C)**	**32 (G)**	**125 (K)**	**0**	**3**	**8**

* Products from manufacturers, importers or suppliers who require a certificate. For products from companies with no past difficulties, use reduced inspection; products from known companies with some past difficulties use normal inspection; for unknown products or unknown companies use tightened inspection. In other words where products have a history of conformance they will be tested at a reduced sampling rate. The presentation of a favourable overseas testing certificate for new products can result in a lower level of inspection.

[1] In the event of an appeal to the results of a test a tightened sampling process with a higher level of sampling will be followed.

The performance of all of the articles selected as the sample will be used to judge the merits of the submission. All samples submitted will be subjected to physical examination as well as safety performance testing. Each article can either pass or fail, the number of articles that may fail before the submission is rejected is given in the table above. If any of the critical non-conformance as set out in appendix 5 are exceeded it will constitute a failure of the lot that the sample represents. Multiple non-conformities in any one firework will only be counted as one failure, however the occurrence of a critical non-conformance will always supersede a non-critical non-conformance.

8.4 Failure and rejection of a lot.

In the event of a lot failing due to an unacceptable level of nonconformities the manufacturers or importers can lodge an appeal for a further set of tests to be conducted. These tests will be done under a tightened sampling plan, similar to that of an unknown company. In the event of the lot failing this further round it will be rejected with no further recourse. In the event of the lot passing the test it would be deemed to have passed the tests but the manufacturer will be classified for further testing to be one that has had some past difficulties.

All products submitted for test by manufacturers or companies, unless quite evidently new to the market will be initially tested under normal or reduced inspection levels. Products submitted for test by a manufacturer or company will be eligible for reduced level of testing in the event of presenting the results of two sets or consignments of fireworks that had no lot failures during the tests. Products submitted for test by a Manufacturer or a company that has more than two lot failures in each of two consecutive submissions will be tested under a tightened inspection level. Normal inspection or reduced levels will be used after the company's product has had less than two lot failures in two consecutive submissions.

9. Reporting and record keeping

9.1 Introduction.

In keeping records, traceability of any item throughout the process must be ensured as well as the keeping and recovery of records for later purpose.

A documented system of ensuring that the fireworks can be tracked shall be kept at the testing facility.

The facility shall also keep documented records of the test procedures used to determine the design and structural values.

The test procedures as well as assessment criteria used to determine a non-conformance shall be documented and kept as part of the records.

Where test procedures change the records and documents should be changed accordingly

9.2 Required information

The following information shall be kept with regard to each lot that has been tested.

- The date on which testing occurred
- The lot number or lot descriptors.
- The type of fireworks.
- Results of the labeling inspection
- The results of the physical examination – as per the sheet in Appendix 7
- The results of the performance testing – as per the sheet in Appendix 7
- A copy of the certificate that has been issued for the lot. – as per Appendix 7
- A copy of the visual recordings of the firework as well as the reference to the actual visual information. In the case of non visual recording a report by the tester on any non conforming event will be required.
- In the event of a firework not conforming to the labeling requirements a visual record or report of the labeling used on the firework will be kept.
- Conditions under which the test were conducted.
- The name of the officiating testing officer.

The testing facility will keep all records pertaining to the testing of fire works including visual ones for a minimum of five years after the date of testing.

9.3 Documents provided to persons requesting the testing of fireworks.

After each test the following will be supplied to the seller, manufacturer, importer or any person that required that testing be conducted on fireworks presented to the testing facility.

- A test report detailing the findings of the tests as well as performance values for each of the lots presented. This report would also detail all non-conformances found during the test procedure.

- A certificate of conformance that states:
  - No non-conformances were found with regard to the labeling requirements as set out in this standard
  - No non-conformances were found with regard to the structure and design criteria as set out in this standard.
  - No critical safety performance non-conformances as set out in this standard were found.

  This certificate will clearly indicate the name of the seller, the lot numbers and other identifying marks on the firework.

  This certificate will have the name of the testing facility and date of testing and the name of the tester on it.

  A copy of the certificate will be given to the seller. Unalterable electronic copies will be supplied on request to the seller (eg in PDF format)

  The certificate will identify all the lots found to be acceptable from one sample presentation from a supplier.

If so required, the seller may request that individual certificates are used for each lot.

Appendix 1

Definitions

Definitions as per Queensland Code of Practice - Control of Outdoor Fireworks Displays and of relevance to this standard

aerial shell is a firework which is designed to burst high in the air and is projected from a mortar by a lifting charge. Aerial shells are typically cylindrical or spherical canisters containing pyrotechnic or novelty effects with an internal explosive charge intended to break the shell. Attached to the base of each shell is a lift charge consisting of a propellant primed with a length of quickmatch fuse, an electric igniter or green safety fuse. Aerial shells may contain stars, comets, serpents, flashpowder, gunpowder, crackers, streamers or other effects.
An *aerial shell* is a cylindrical or spherical cartridge containing chemical composition, and a black powder propelling charge (lift charge). Shells are most commonly 50 mm. to 150 mm diameter and are fired from high-density polyethylene (HDPE), fibreglass or heavy cardboard tubes. Upon firing, the lift charge is consumed and the shell is projected into the air. The pyrotechnic effect is produced near the highest point of flight when a bursting charge within the shell explodes, dispersing effects such as stars or whistles.

close proximity firework is a firework where the minimum clearance distances are less than distances for an outdoor display firework as permitted in Section 6 of the Code of Practice – Control of Outdoor Fireworks Displays. A close proximity firework may be used indoors or outdoors.

explosive includes—
(a) a substance or a thing containing a substance, manufactured or used with a view to produce-
    (i) a practical effect by explosion; or
    (ii) a pyrotechnic effect; and
(b) a substance or thing declared under a regulation to be an explosive.

Examples of explosives—
Ammunition, detonators, gunpowder, nitroglycerine, pyrotechnics (including fireworks).

explosive substance is a solid or liquid substance (or a mixture of substances) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic substances are included even though they do not produce large volumes of gases.

firework is a pyrotechnic article containing explosive composition which, upon functioning, will burn or explode, or both, to produce a visual effect or aural effect, or both, and which is intended as a form of entertainment. Loose firework compositions, eg stars and powders are not included in this definition.

flash powder is a pyrotechnic substance contained in salutes and other pyrotechnic sound devices, which explodes with a brilliant flash of light and loud sound and includes photoflash powder (UN0094 Division 1.1G and UN0305 Division 1.3G), but excludes gunpowder.

flash powder type composition is a composition that is predominantly a mixture of perchlorates and metal powders. The composition may contain other substances such as binders and colour agents. The composition may have an application either in loose powder or consolidated form.

ground display is a display of fireworks which primarily function on the ground and which may project stars, novelty and other effects above the ground. Ground fireworks include mines, Roman candles, lances, fountains and wheels. It does not include aerial shells.

gunpowder is a dry explosive consisting generally of potassium nitrate or sodium nitrate, charcoal and sulphur, which, under normal conditions, deflagrates rather than detonates
NOTE: It has a relatively low energy output and is classified as a low explosive (UN0027 and 0028, Division 1.1D).

hazardous debris is any debris produced or expelled by the functioning of a firework that is capable of causing personal injury or property damage, including, but not limited to hot sparks, heavy casing fragments, component fragments, clay plugs and unignited components.

The ***manufacture*** of an explosive, including fireworks, includes—

(a) taking a step or process for producing an explosive, including fireworks; and
(b) remaking or reconditioning an explosive, including fireworks; and
(c) altering the chemical or physical nature of an explosive, including fireworks; and
(d) breaking up or sorting out explosives, including fireworks but does not include preparing for use.

mass is the gross mass of a firework. (Any mass referred to in this Code of Practice is the gross mass unless otherwise stated.)

Net Explosive Quantity for an explosive article is the mass of the explosive components only and is exclusive of any non-explosive components.

outdoor display firework is any firework intended for use only in outdoor fireworks displays.

prepare for use means operations preparing a firework for a display and involves the fitting of igniters and priming devices such as attaching fuses, quickmatch and electric fuseheads and repairs to broken leaders.

pyrotechnic device is any packaged pyrotechnic substance or substances, or pyrotechnic unit, e.g. aerial shell.

pyrotechnic substance is a substance or mixture of substances designed to produce an effect by heat, light, sound, gas or smoke or a combination of these, as a result of non-detonative self sustaining exothermic chemical reactions. Pyrotechnic substances do not rely on oxygen from external sources to sustain the reaction and includes flash powder, gunpowder and coloured fire compositions.

pyrotechnic unit is a discrete unit containing a pyrotechnic substance which is assembled into a fireworks case and which, upon functioning, will burn or explode to produce a visual effect or aural effect, or both.

person includes an individual and a corporation. A reference to a person generally includes a reference to a corporation, as well as an individual, and is not displaced merely because there is an express reference to either an individual or a corporation elsewhere.

To ***possess*** an explosive, including a firework, includes—

a) having custody or control of the explosive, including a firework; and
b) having an ability or right to obtain custody or control of the explosive, including a firework.

process building is a building on premises licensed for the manufacture or storage of explosives, other than for immediate use, in which any explosive is manufactured or any ingredient of an explosive is used in a manufacturing process.

A ***ready box*** is a portable, weather resistant container that protects the contents from burning debris with a self-closing cover or equivalent means of closure required.

A ***report*** is a loud noise intended for the main effect from a pyrotechnic unit or a firework. The effect from the report is usually achieved by confining flash powder. Reports are effects from fireworks such as multi-shot boxed items, aerials shells, crackers, and maroons.

risk is the chance of something happening that will have an impact upon objectives. It is measured in terms of consequence and likelihood.

safety management system means a system for managing safety which sets out—

(a) the safety objectives;
(b) the systems and procedures to achieve the safety objectives;
(c) the performance standards to be met, and
(d) the means to maintain these standards.

salute is a special type of aerial shell containing a flash powder type composition, intended only to produce a report or noise and flash.

seller is the person licensed under the Explosives Act 1999 (Qld) to sell fireworks. Sell includes the definition in the Explosives Act 199 (Qld).

separation distance (see also *clearance distance*) is the recommended distance intended to -

(a) prevent the immediate direct propagation of an explosion or fire from one magazine to another by missile, flame or blast; and
(b) minimize the risk of an explosion which has the potential to cause damage to protected works or injury to persons.

string of firecrackers is a number of firecrackers chain fused by the manufacturer. The firecrackers are not designed to be fired individually and may be in strings containing 10 000, 20 000, 50 000, etc firecrackers.

superior package means a package which affords extra protection against damage, external stimuli and extra protection to adjacent packages from inadvertent functioning of the contents of the package

supplier is the person who sells, provides, imports or exports explosives, including fireworks.

unrestricted fireworks are fireworks not requiring a licence for purchase, possession or use. Unrestricted fireworks include amorces, toy pistol caps, indoor table bombs, starting pistol caps, sparklers, snaps for bon-bon crackers, streamer cones, indoor decorative fountains and model rocket motors with a maximum weight of 62.5 grams.

Appendix 2

Labeling criteria

General requirements

Border Line - All text information should be completely within a borderline

In English- Required information on the unit is displayed in understandable English.

Contrasting Background - The text displayed in a contrasting colour to the background

Minimum Font Size- Record the smallest font size used on the labelling in millimetres. Is it
easily read?

Manufacturer's name – The manufacturer's name displayed on the item's label.

Supplier's name – The supplier's name is clearly displayed on the item's label. Either manufacturer's or supplier's name to be supplied.

Contact Details - Australian contact details for the manufacturer and or supplier displayed on the item label (Telephone or web site details will suffice)

Trade Name - Is trade name displayed on item? eg Viper, Dragon Eggs etc

Warning Label - Does the warning label contain the appropriate warnings as per AS2187.4 - "Warning - Dangerous Explosive, do not handle - contact Police. This way up" with an arrow.

UN Number- Does the item have a UN number on it? Record the number eg UN 0335.

Hazard Division Classification – Is the hazard division clearly identified eg 1.3, 1.4?

Description - Are the item effects adequately described? eg breaks with report etc. Record effect types or make reference to effects in title block.

Instruction for use - Does the item have the following instructions for use - outdoor use only, do not hold in hand, do not lean over item when lighting, light fuse and get way?

In the specific case of aerial shells

Size of shell – Is the nominal shell size clearly stated on the label eg 4" or 100mm?

Appendix 3

Structural criteria

Criteria	Notes	Evidence
Damage	No signs of any damage or impact on item or fuse from manufacturing process or transportation.	
Water Damage	Note any evidence of item having been wet.	
Lift Charge (aerial shells)	Check for presence of lift powder.	Presence of filled bag below shell
Composition leak	Determine by holding item over a clean piece of white paper and lightly shake, then invert the item and lightly shake.	Presence of any composition on paper should be noted and is unacceptable.
Structural integrity	Note any evidence of item breaking apart or glue not bonding item together, or at shell seam or lift bag attachment area.	Visible and tactile signs sufficient evidence.
Safety cap removes easily	Safety cap must be able to be removed with ease and without dislodging or damaging the leader fuse.	No physical force above that of removing a pen cap should be required. No visible signs of damage to the leader fuse.
Leader fuse safety cap	Must be a different colour to the quickmatch. eg red	Visibly evident
Protrusion of quickmatch	Length of quickmatch (not leader fuse) protruding from the top of a **standard length mortar tube** with the aerial shell correctly installed. Required minimum protrusion is 150 millimetres.	Comparison of measured length with that required.
Leader fuse suitably attached	Leader fuse must be securely fixed into quickmatch so that it can support a 200g mass without it being dislodged	Comparison of pull weight and weight of shell

For the purposes of measuring the length of required fuse and clearance distances standard mortar tube lengths and bore diameters have been specified as follows.

Mortar description	Mortar bore diameter	Standard length
2”	50mm	320mm
2.5”	63mm	390mm
3”	76mm	430mm
4”	102mm	500mm
5”	127mm	750mm
6”	152mm	900mm
8”	203mm	1220mm

Appendix 4

Physical information that can be obtained during measurement and testing.

- Weight - Record weight within 1 g or in cases where this absolute accuracy might be impractical to an accuracy of not less than 0.1% of total weight.
- Maximum diameter - The maximum diameter of an aerial shell, not including quickmatch fuse with lift bag intact. Record in millimetres.
- Minimum diameter- The minimum diameter of an aerial shell, not including quickmatch fuse with lift bag intact. Record in millimetres.
- Average aerial shell diameter - The average value of the two preceding dimensions. Recorded in millimetres.
- Aerial shell length - Measured from the top of shell to bottom of lift charge bag. Record in millimetres.

By calculation

Maximum clearance - The difference between the maximum inside diameter of the standard mortar tube and the minimum diameter of the aerial shell. Record in millimetres.

Minimum clearance - The difference between the minimum inside diameter (or bore) of the standard mortar tube and the maximum diameter of the aerial shell. Record in millimetres.

Average clearance - The difference between the average inside diameter of the standard mortar tube and the average diameter of the aerial shell. Record in millimetres.

Aerial Shell weight - The aerial shell weight should include the quickmatch and leader fuse. Record in grams.

Weight Before Firing Weight of item (in grams) before firing or adding any additional material for fusing set up.

Weight After Firing - Weight of item (in grams) after firing, remove any additional material added for fusing set up eg masking tape, wires.

Composition Mass - Is the calculated difference between the above weights. This will give an approximate composition mass. Record in grams. This approximation can only be determined for devices which are not totally consumed during their operation e.g. multi-shots, fountains, candles.

Dimensions Length- This is the overall length of the item including any wrapping material. Recorded in millimetres.

Width- This is the overall width of the item including any wrapping material. Recorded in millimetres.

Height- This is the overall height of the item including any wrapping material. Measured from the base to the top of the highest tube. Recorded in millimetres.

Across Flats - This dimension is only recorded for items that have a hexagonal base. Recorded in millimetres.

Tubes

No. of Tubes - Record from the labelling and verify the number of tubes in the item. Record number of tubes, if a discrepancy exists, record in comments column.
No of tubes fired - Record number of tubes that fired during test.
Max ID of tubes - The maximum internal dimension taken from a random selection of tubes in the item. Note measurements taken after item has been fired. Recorded in mm.
Min ID of tubes - The minimum internal dimension taken from the same random selection (as above) of tubes in the item. Note measurements taken after item has been fired. Recorded in mm.
Length of Tube -The internal length taken from a random selection of tubes in the item, by measuring from the top of the tube to the top of the internal bottom plug. Note measurements taken after item has been fired.
Average Wall thickness - The wall thickness near the top of random selection of tubes in the item. Note measurements taken after item has been fired.
Fuse Diameter - Record the Average diameter of exposed leader fuse (visco) that is not coated in prime
Fuse Length - Record the length of exposed leader fuse (visco) from the primed tip to where the fuse enters the item.
Leader fuse burn time - The time from electric fuse head initiation to lift charge ignition.
Fireworks duration - The time from electric fuse head initiation to burst charge ignition. Time taken from the videotape record by counting frames or from a chart recorder and microphone data record. Record in seconds
Observation distance - The distance from where the item is fired to the observer's position.
Elevation angle from observation point - The elevation angle of the shell burst as measured from the observation point.
Burst height - Calculate using the elevation angle recorded from the observation position using the distance from the observer to the point of initiation and the angle recorded.

Fusing / timing of initiation

Leader fuse burn time - The time from electric fuse head initiation to lift charge ignition in the first tube.
Internal fusing - Internal fusing is seen to be part of the pyrotechnic device and any malfunction of these fuses will be evident in the actual performance. This will not be investigated specifically.

Delay between effects in a multishot device.
The maximum delay between cessation of one tube and the firing of the next tube in a combination or multishot shall be five seconds.

Appendix 5

Safety Performance criteria

Note: To enable test to be conducted in a practicable and unambiguous fashion, performance is evaluated against non-compliant criteria.

If during the firing of a firework sample the number of occurrences of critical non-conformances exceed the acceptability criteria the specific fireworks is deemed to have failed the performance test.

Non-critical non-conformances will also be reported to the client the results of which will appear on the performance test sheet.

The evidence of any such failure must be able to be presented to the client if so required.

The compliance criteria as set out in the general compliance criteria with regard to structural integrity and labeling must be met before safety performance criteria are to be assessed.

In general any firework that undergoes a detonation with physical damage to the device or holding structure or has such an erratic functioning of a part of it that it has an effect outside the safety exclusion zone has functioned in a critically non-conforming way.

Non compliant safety performance criteria for aerial shells.

(Single, chained or multi-break and includes salutes)

These criteria are for pyrotechnic devices that generally are fired into the air by whichever means and that after a certain time of flight into the air, fires the effect.
There is one point of initiation for the device.
The item has to be used with a mortar tube suitable for the specific device size.
These devices do not include rockets that are deemed to be prohibited explosives

Non Compliant Criteria	Description	Evidence	Critical
Misfire	Shell does not fire from the mortar tube after being lit.	*Evidenced visually*	N
Hang fire	Shell does not fire from the mortar tube until an unacceptably long period of time has passed after the fuse has been lit. (An unacceptably long period is greater than 10 seconds after the fuse has been lit.)	*Evidenced visually*	N
Flowerpot	Shell explodes relatively weakly in the mortar tube, which usually remains intact.	*Evidenced visually*	N
Mortar burst	Shell explodes violently in the mortar tube, which is often destroyed.	*Evidenced visually and by visible damage to the mortar tube.*	Y
Load charge too severe for mortar tube	Mortar tube shows significant damage or deformation after firing a shell from a mortar tube of acceptable quality.	*Evidenced visually at the hand of deformation of the mortar tube as well as louder than normal report during the lift charge going off or the shell reaching an higher altitude.*	Y
Dud shell	Shell leaves the mortar tube but does not burst and falls to ground as a live shell.	*Evidenced visually and by the presence of the actual unfired shell*	Y
Dud components	Shells bursts at altitude but shell components fail to light and fall to the ground as live items.	*Evidenced visually and by finding components on the ground.*	N
Muzzle break	Shell bursts within a short distance of leaving the mortar tube and scatters burning stars near ground level. (< 1metre of leaving tube)	*Evidenced visually and by observation of height*	N
Low break.	Shell bursts at too low an elevation either on the upwards or downwards path and is evidenced by burning stars visibly reaching down below ten meters above ground level. In the case of salutes if the shell breaks at a height of 30 meters or less	*Evidenced visually and by height observation*	N
Ground break	Shell fires from the mortar tube but does not burst at altitude, falls and bursts on the ground.	*Evidenced visually*	Y
Erratic flight -	If the aerial shell after leaving the mortar tube deviates from the path that would have been expected from it under prevailing conditions by such a factor that the burst diameter and height combine to have an effect outside the safety exclusion zone.	*Evidenced visually by appropriate position of observers.*	Y
Burning fallout	Shells bursts at altitude but burning components fall to ground.	*Evidenced visually-requires night firing to fully observe range of burning components.*	N

Non compliant safety performance criteria for multi-shot items, may also be known as boxed items or cakes.

These pyrotechnic devices consist of a number of individual pyrotechnic devices that are linked together both in structure and in sequence of firing. The device may have one or two points of initiation. The individual pyrotechnic devices contained in the multi-shot device could consist of similar items to aerial shells, roman candles, mines etc. These individual devices are usually of the type that projects a secondary and following effect from a tube by means of a lift charge. The item functions without the need for any other equipment.

Non Compliant Criteria	Description	Evidence	Critical
Misfires	The device does not function after being lit.	*Evidenced visually*	**N**
Hang fire	The device does not fire until an unacceptably long period of time has passed after the fuse has been lit. (An unacceptably long period is greater than 10 seconds after the fuse has been lit.)	*Evidenced visually*	**N**
Incomplete firing	Individual device or devices within the sequence remain unfired.	*Evidenced visually*	**N**
Burst in tube	A firing of any of the lift or effects in the tube of any of the individual devices that would cause any form of structural damage to the overall devices and or cause the malfunction of further devices in the sequence.	*Evidenced visually*	Y
Muzzle break	The effect bursts within a short distance of leaving the device tube	*Evidenced visually*	**N**
Low break	Where an effect fires lower than ten meters above the ground.	*Evidenced visually*	**N**
Flash through (multiple, near simultaneous firing)	Where the firing of one device activates one or more of the other devices following in sequence	*Evidenced visually*	**N**
Dud components	Effect leaves mortar tube but components fail to light and fall to the ground as live components.	*Evidenced visually*	**N**
Erratic flight	If the effect after leaving the tube deviates from the normal path that would have been expected from it under prevailing conditions by such a factor that the burst diameter and height combine to have an effect outside the safety exclusion zone.	*Evidenced visually*	**Y**

Non compliant safety performance criteria for Roman candles

These devices are of the type that project effects from a tube by means of individual lift charges.
There is usually a sequence of more than one item being projected from a single device.
These effects are internally fused and sequenced. The item functions without the need for any other equipment.

Non Compliant Criteria	Description	Evidence	Critical
Misfires	The device does not function after being lit.	*Evidenced visually*	**N**
Hang fire	The device does not fire until an unacceptably long period of time has passed after the fuse has been lit. (An unacceptably long period is greater than 10 seconds after the fuse has been lit.)	*Evidenced visually*	**N**
Incomplete firing	Individual device or devices within the sequence remain unfired.	*Evidenced visually*	**N**
Burst in tube	A firing of any of the charges in the tube that would cause any form of structural damage to the device and or cause the malfunction or activation of further devices in the sequence.	*Evidenced visually*	**Y**
Muzzle break	The effect bursts within a short distance above the muzzle of the tube.	*Evidenced visually*	**N**
Dud components	Effect leaves tube but components fail to light and fall to the ground as live components.	*Evidenced visually*	**N**
Flash trough (Multiple, near simultaneous firing)	Where the firing of one effect activates one or more of the other devices following in sequence resulting in a visible and noticeable malfunction of the overall device.	*Evidenced visually*	**N**
Erratic flight	If the effect after leaving the tube deviates from the normal path that would have been expected from it under prevailing conditions by such a factor by such a factor that the burst diameter and height combine to have an effect outside the safety exclusion zone.	*Evidenced visually*	**Y**

Non compliant safety performance criteria for Mines.

These are devices that simultaneously project a number of effects into the air by means of a single lift charge.
The item has to be used with a mortar tube suitable for the specific device size.
It has one point of initiation.

Non Compliant Criteria	Description	Evidence	Critical
Misfire	Mine does not fire from the mortar tube after being lit.	*Evidenced visually*	**N**
Hang fire	Mine does not fire from the mortar tube until an unacceptably long period of time has passed after the fuse has been lit. (An unacceptably long period is greater than 10 seconds)	*Evidenced visually*	**N**
Mortar burst	Mine explodes violently in the mortar tube, which is often destroyed.	*Evidenced visually*	**Y**
Dud components	Mine fires from the mortar tube but components fail to light and fall to the ground as live items.	*Evidenced visually*	**N**
Burning fallout	Mine fires from the mortar tube but burning components fall to ground.	*Evidenced visually- might require nighttime testing to fully observe components*	**N**

Non compliant safety performance criteria for Comets.

A comet produces a rising effect in which a single large pellet of composition is ignited in the mortar tube and propelled upward by a lift charge. Most comets leave a trail of sparks, but some may only consist of a single point of coloured light. The item has to be used with a mortar tube suitable for the specific device size. It has one point of initiation.

Non Compliant Criteria	Description	Evidence	Critical
Misfire	Comet does not fire from the mortar tube after being lit.	*Evidenced visually*	**N**
Hang fire	Comet does not fire from the mortar tube until an unacceptably long period of time has passed after the fuse has been lit. (An unacceptably long period is greater than 10 seconds)	*Evidenced visually*	**N**
Mortar failure	Because comets are heavy for their size and tend to have less space below them when loaded into a mortar tube, higher mortar pressures can be produced causing mortar tube failure.	*Evidenced visually*	**Y**
Burning fallout	Comet fires from the mortar tube but pieces of the main pellet are broken off during firing and fall to ground still burning. Also comets may have long burn duration and if not propelled by the lift charge to adequate height may fall to ground still burning.	*Evidenced visually- might require nighttime testing to fully observe components*	**N**
Dud components	Comet fires from the mortar tube but fails to light and falls to the ground as a live item.	*Evidenced visually*	**N**

Non compliant safety performance criteria for Fountains, Gerbs.

Pyrotechnic devices that emit a shower of sparks

Non Compliant Criteria	Description	Evidence	Critical
Misfire	Device does not fire after being lit.	*Evidenced visually*	**N**
Hang fire	Device does not fire until an unacceptably long period of time has passed after the fuse has been lit. (An unacceptably long period is greater than 10 seconds)	*Evidenced visually*	**N**
Tube failure	Pressure developed within the device during operation exceeds the strength of the tube and it explodes.	*Evidenced visually showing rupture of tube*	**Y**

Non compliant safety performance criteria for Wheels.

Wheels are pyrotechnic devices designed to revolve about an axle fixed to a support above the ground. The device consists of a number of pyrotechnic drivers arranged to produce thrust causing the assembly to spin and produce patterns of sparks. They may operate in the vertical or horizontal plane.

Non Compliant Criteria	Description	Evidence	Critical
Misfire	Drivers do not fire after being lit.	*Evidenced visually*	**N**
Hang fire	Drivers do not fire until an unacceptably long period of time has passed after the fuse has been lit. (An unacceptably long period is greater than 10 seconds)	*Evidenced visually*	**N**
Incomplete firing	Individual drivers within the assembly remain unfired.	*Evidenced visually*	N
Driver connection.	Driver unit(s) become detached from wheel assembly during operation	*Evidenced visually*	**N**
Wheel connection	Complete wheel assembly becomes detached from centre axle or support during operation.	*Evidenced visually*	**N**
Driver tube burst.	Driver unit(s) explode during operation	*Evidenced visually*	**N**

Appendix 6
General measurements taken during safety performance testing

Temperature – Outside temperature displayed by the weather station mounted in the firing shelter. Record in degrees centigrade.
Relative humidity - Outside humidity displayed by the weather station mounted in the firing shelter. Record in % RH.
Wind Direction - Wind direction displayed by the weather station mounted in the firing shelter. Record direction eg N, W.
Wind Speed- Wind speed displayed by the weather station mounted in the firing shelter. Record in km/h.

Fireworks Duration - The time from electric fuse head initiation to the burst of the last effect. Time taken from the videotape record by counting frames or from a chart recorder and microphone data record. Record in seconds.

Observation Distance - The distance from where the item is fired to the observer's position. Record in metres.

Burst Heights

Maximum **-** The maximum elevation angle of the burst charge or effect, measured from the observation point.
Minimum **-** The minimum elevation angle of the burst charge or effect, measured from the observation point. Record in degrees.

Maximum and minimum heights are calculated using the above angles and
Height = Tan(elevation angle) x observation distance in metres.

Burst Diameter – The maximum overall diameter of the item's effect, as spread by the burst charge. This may not be applicable to certain effect types found in some multishot items. Measured using a grid overlayed on a videotape frame selected as best representing the effect to be measured. Requires video frame capture ability and graphic software. Record in metres.

Drift - The approximate horizontal distance between the firing point (ground) and the position of the centre of the effect (aerial). Distance estimated by observation of the event. Record distance in metres and drift direction eg E, NW etc.

Debris - ***Type*** **-** What type of debris, eg cardboard, paper?
- ***Direction*** **-** What direction from the firing point did the debris fall? eg E, NW etc.
- ***Distance*** **-** The distance from the firing point to the debris on ground.
- ***Size*** **-** The maximum observed size (include maximum weight for any piece recovered)

Appendix 7 - Examples of reports

Certificate of conformity with the Standard

(Done on the letterhead of the testing facility or laboratory)

(The letter head will include the accreditation and quality associations of the organisation.)

Certificate of Conformity

The following fireworks were sampled and submitted for inspection and testing by; **(Full particulars of the organisation or person submitting the sample for testing.)**

……..

……

Lot number	Manufacturer	Type description	Size/ assembly	Effect	Identifying number

1. The fireworks as described above have been inspected for labelling according to the stipulations of the Queensland Fireworks Product Safety Sampling and Test Standard and no non-conformities have been found.
2. The fireworks as described above have been inspected for structural and visible design defects according to the stipulations of the Queensland Fireworks Product Safety Sampling and Test Standard and no non-conformities have been found.
3. The fireworks as described above have been tested for safety performance according to the stipulations of the Queensland Fireworks Product Safety Sampling and Test Standard and no critical safety non-conformities have been found.

Date sample submitted ……..

Date test completed …….

Date of issue of this certificate……

Testing Officer……

Testing report

(Done on the letterhead or a special form of the testing facility or laboratory)

The following fire works were sampled and submitted for inspection and testing by
(Full particulars of the organisation or person submitting the sample for testing)

Lot number: ……Lot Size …… Sample size…….

Manufacturer/supplier……

Type/description……..

Size/assembly……..

Effect……..

Identifying number……..

Date received……

Date tested/testing completed…….

Tested by……..

Labelling

Requirement	Acceptable	Comment
Border Line		
Understandable English		
Contrasting Background		
Minimum Font Size		
Manufacturer's name		
Supplier's name		
Contact Details		
Trade Name		
Warning Label		
UN Number present and correct		
Description		
Instruction for use		
Size of shell		

Comments on labelling:

……

Structural and design measurements

Requirement	Acceptable	Comment
Damage		
Water Damage		
Lift Charge		
Composition leak		
Structural integrity		
Safety cap removes easily		
Leader fuse safety cap- different colour		
Protrusion of quickmatch		
Leader fuse suitably attached		

Comments:

……

……

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Physical dimensions and performance

Description			
Weight Before Firing			
Weight After Firing			
Calculated NEQ			
Average maximum diameter			
Average minimum diameter			
Average diameter			
Maximum clearance			
Minimum clearance			
Average clearance			
Length			
Max ID of tubes			
Min ID of tubes			
Average Wall thickness -			
Length of Tube			
No. of Tubes			
No of tubes fired			
Leader fuse burn time			
Fuse Length			
Fuse Diameter			
Fusing/timing of initiation			
Fireworks duration			

Description (cont)			
Burst height max			
Burst height min			
Burst Diameter			
Drift			
Debris close			
Debris far			
Observed encroachment on safety distance			
Colour of effect			
Type of effect			

Comments

……

……

……

……

Testing conditions

Temperature ……..

Relative humidity ……

Wind Direction……..

Wind Speed……..

Observation Distance ……

Safety performance

Sample item number	Non-conformance	Comments

General comments

……..

……..

……..

Testing Officer's Signature …… Date ……..……