

**STANDARDS FOR THE
PERFORMANCE / PURCHASING
OF
PLASTIC KEG
BEER CONTAINERS
WITHIN THE FOOD & BEVERAGE
INDUSTRY**

Executive Summary:

The following documents refer to reusable and single use draught plastic beer containers and are an industry recommendation to address best practice in the design, manufacture, purchase and performance of said containers, to ensure due diligence.

The information held within these documents is drawn from previous industry standards.

These documents may be used separately or in combination, as required

Thanks are given to the UK brewers who have engaged throughout the process.

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GENERIC MINIMUM PERFORMANCE SPECIFICATION

PLASTIC KEG

REFILLABLE / SINGLE USE

WITHIN THE FOOD & BEVERAGE INDUSTRY

1. PRESSURE

1.1 Safe Working Pressure

The Safe Working Pressure of all containers shall be 3.10 Barg (45 Psig).

1.2 Maximum Working Pressure.

The Maximum Working Pressure of all containers shall be 4.14 Barg (60 Psig).

1.3 Proof Pressure Testing at Point of Manufacture

1.3.1 Refillable Kegs:

Every container manufactured should be pressure tested to Proof Pressure, 6.20 Barg (90 Psig) or vent pressure – each venting device to be tested to vent between Maximum Working Pressure 4.14 Barg (60 Psig) and Proof Pressure 6.20 Barg (90 Psig). A validated quality assurance programme (i.e. industry accepted, statistical process control) may allow for burst testing on a sample basis at a mutually agreed frequency.

1.3.2 Single Use Kegs:

Every container manufactured should be pressure tested to Proof Pressure, 6.2 Barg (90 Psig), or vent pressure – each venting device to be tested to vent between Maximum Working Pressure 4.14 Barg (60 Psig) and Proof Pressure 6.20 Barg (90 Psig). A validated quality assurance programme (i.e. industry accepted, statistical process control) may allow for burst testing on a sample basis at a mutually agreed frequency.

1.4 Venting Pressure

All new containers may be sold with appropriate extractor system. All new extraction systems fitted shall be safety defined to an approved written design, specification, procedure and warranty (guarantee). The extraction system/component's information, specifications, drawings and manuals are to be detailed separately by the approved supplier.

1.4.1 Containers, which must be free-standing during the test, must fail in a safe / non projectile manner (see 1.5 below), whether in whole or in part.

1.4.2 Single use kegs - A burst disc or pressure relief valve may not be required if the container fails safely under all conditions (see 1.5 below)

1.5 Pressurisation to Failure

When a keg is in service or for any test performed, whether kegs are full, part full, empty or pressurised they should fail safe in all events. Fail safe criteria means no fragmentation or

ejection of components; vent of liquid or gas contents only without propulsion of the keg, valve or any portion thereof. Fail safe applies at all times including failure when a keg is in service.

1.5.1 During product development, kegs should be pneumatically tested to failure. At manufacturing stage, containers should be tested to destruction, at the discretion of the manufacturer i.e. via hydrostatic, pneumatic or hydraulic means.

1.6 End of Life venting

The container must be constructed so that, after emptying, the excess pressure can be safely and easily released to atmospheric pressure.

When disposing of plastic kegs, please refer to the manufacturer's guidelines. However, please note that the bursting of any pressurised container with a knife or any means, which may lead to an explosive evacuation of pressure, is not recommended.

1.7 Cleaning & Filling (Refillable Kegs)

Single Use Kegs are expected to arrive sterile, ready for fill and are not expected to be subjected to any pre cleaning regime. However, any purchaser of either Single Use or Refillable Kegs should ensure container compatibility with their existing container filling lines, prior to purchase.

Cleaning and filling processes deployed by the customer are not standard and vary significantly. Refillable kegs must be capable of withstanding the following parameters throughout the life of the keg:

Air Injected :	containers capable of withstanding to maximum 3 Barg
Pre Rinse :	containers capable of withstanding 60 seconds, not above 85 °C
Cleaning Agent:	those recommended by the Customer's cleaning process and manufacturer
Rinse :	containers capable of withstanding 60 seconds, not above 85°C
Steam :	containers capable of withstanding 60 seconds at 135°C

1.8 Leak-tightness

After manufacture every container shall be leak tested by an approved method (either by means of air-under-water, gas detection, vacuum pull or equivalent). A validated quality assurance programme (i.e. industry accepted, statistical process control) may allow for burst testing on a sample basis at a mutually agreed frequency.

1.9 Storage

Containers must not be stored in direct sunlight, heat source or in extremes of temperature.

2 TESTING REGIME

2.1 PRODUCT DEVELOPMENT TESTING

In order to verify the container's physical properties and characteristics, container manufacturers should, in product development stage, test the performance of a container when subject to:

- Intense cold (down to -29°C)
- Intense heat (up to 60°C)
- Change in temperatures from intense cold to intense heat

Tests should be undertaken with containers in the following state:

- Full
- Partially full
- Empty

Tests should include:

- Static keg test
- Drop tests (per Manufacturing tests below)
- Pneumatic tests to failure
- Accelerated Lifecycle testing
- Holding kegs at Safe working Pressure for elongated time periods
- Holding kegs at Maximum Working Pressure for elongated time periods
- Holding kegs at Proof Pressure for elongated time periods

Any container failures during all tests should fail safe (see section 1.5 above) and should, as appropriate, be communicated to the customer / end user.

It is suggested that tests be operated over three sessions in order to replicate possible situations.

2.2 TESTING DURING MANUFACTURE

DROP TESTS (CONTAINER TO BE DROPPED 3X FOR BOTH REFILLABLE AND SINGLE USE CONTAINERS)

Due to the physical properties of plastic, damage caused immediately after completion of these tests (temporary deformation) is expected to lessen over time. Permanent deformation is expected and should be measured 24 hours after completion of the third drop.

Any container failures during drop tests should fail safe (see section 1.5 above)

The recommended frequency for tests completed during manufacture is every 24 hours or for every 10K containers manufactured, whichever parameter occurs first.

REFILLABLE CONTAINERS ONLY:

2.2.1 45° ANGLE DROP TEST

Scope: The purpose of this document is to provide guidance on drop/impact testing on pressurised and/or non-pressurised beer kegs. This guide is for kegs 20L to 50L. This test

method does not address all of the safety concerns. It is the responsibility of the user of this method to establish appropriate safety practices.

Purpose: Determine if the keg is fit for use.

Material Components Required for Testing:

1. Test Keg and corresponding components
2. Water
3. Thermometer
4. Valve
5. Measuring Device (i.e. tape measure and ruler/calliper)
6. Pressure Gauge
7. Lifting / Tilting apparatus (i.e. a sling)
8. Dropping Surface: 1 inch thick steel plate on concrete

Procedure:

Test 1: Top chimb (or as appropriate) on hand hold drop

1. Fill keg completely with water and pressurise to 1.03 Barg (15 Psig) - at least 99.5% full
2. Measure the following. (See diagram below):
 - a. Top - inside diameter
 - b. 90° from first measurement - inside diameter
 - c. Distance between top of chimb to neck (or as appropriate) at midpoint of spear
3. Lift filled keg to a height of 1.2 meters
4. Tilt keg to an angle of (45°/50°)
5. Utilising a release mechanism, drop keg onto steel plate on the top chimb (or as appropriate) on hand hold
6. Re-measure the following locations on the keg:
 - a. Point of impact – inside diameter
 - b. Perpendicular to point of impact - inside diameter
 - c. Distance between top of chimb to neck (or as appropriate) at midpoint of spear
7. Repeat drop two (2) additional times for a total of three (3) drops for this test
8. Measure after every drop.

Passing criteria for Test 1:

Any change in measurement must meet the following to be deemed a success for test 1.

- Measurement a is less than or equal to 18mm
- Measurement b is less than or equal to 2mm
- Measurement c is less than or equal to 5mm

- No bursting and no leakage

Test 2: Perpendicular to hand hold drop

1. Fill keg completely with water and pressurise to 1.03 Barg (15 Psig) - at least 99.5% full
2. Measure the following:
 - a. Top - inside diameter
 - b. 90° from first measurement - inside diameter
 - c. Distance between top of chimb to neck (or as appropriate) at midpoint of spear
3. Lift filled keg to a height of 1.2 meters
4. Tilt keg to an angle of (45°/50°)
5. Utilising a release mechanism, drop keg onto steel plate at a location perpendicular to hand hold
6. Re-measure the following locations on the keg:
 - a. Point of impact – inside diameter
 - b. Perpendicular to point of impact - inside diameter
 - c. Distance between top of chimb to neck (or as appropriate) at midpoint of spear
7. Repeat drop two (2) additional times for a total of three (3) drops for this test
8. Measure after every drop.

Passing criteria for Test 2: (See diagram below)

Any change in measurement must meet the following to be deemed a success for test 2:

- Measurement a is less than or equal to 18mm
- Measurement b is less than or equal to 2mm
- Measurement c is less than or equal to 5mm
- No bursting and no leakage

Test 3: Bottom chimb/butt weld drop

1. Fill keg completely with water and pressurise to 1.03 Barg (15 Psig) - at least 99.5% full
2. Measure the following. (See diagram below):
 - a. Top - inside diameter
 - b. 90° from first measurement - inside diameter

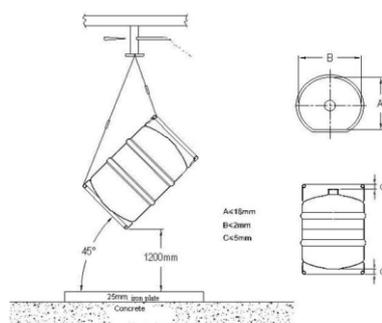
- c. Distance between top of chimb to neck (or as appropriate) at midpoint of extraction system/component
3. Lift filled keg to a height of 1.2 meters
 4. Tilt keg to an angle of (45°/50°)
 5. Utilising a release mechanism, drop keg onto steel plate at a location perpendicular to hand hold
 6. Re-measure the following locations on the keg:
 - a. Point of impact – inside diameter
 - b. Perpendicular to point of impact - inside diameter
 - c. Distance between top of chimb to neck (or as appropriate) at midpoint of extraction system/component
 7. Repeat drop two (2) additional times for a total of three (3) drops for this test
 8. Measure after every drop.

Passing criteria for Test 3:

Any change in measurement must meet the following to be deemed a success for test 3.

- Measurement a is less than or equal to 18mm
- Measurement b is less than or equal to 2mm
- Measurement c is less than or equal to 5mm
- No bursting and no leakage

Summary: Summarise the test results and finalise the report.



2.2.2 HORIZONTAL DROP TEST

Scope: The purpose of this document is to provide guidance on drop/impact testing on pressurised and/or non-pressurised beer kegs. This guide is for kegs 20L to 50L. This test method does not address all of the safety concerns. It is the responsibility of the user of this method to establish appropriate safety practices.

Purpose: Determine if the keg is fit for use.

Material Components Required for Testing:

1. Test Keg and corresponding components
2. Water
3. Thermometer
4. Valve
5. Measuring Device (i.e. tape measure and ruler/calliper)
6. Pressure Gauge
7. Lifting / Tilting apparatus (i.e. a sling)
8. Dropping Surface: 1 inch thick steel plate on concrete

Procedure:

Test: Horizontal Chimb (or as appropriate) Impact Drop

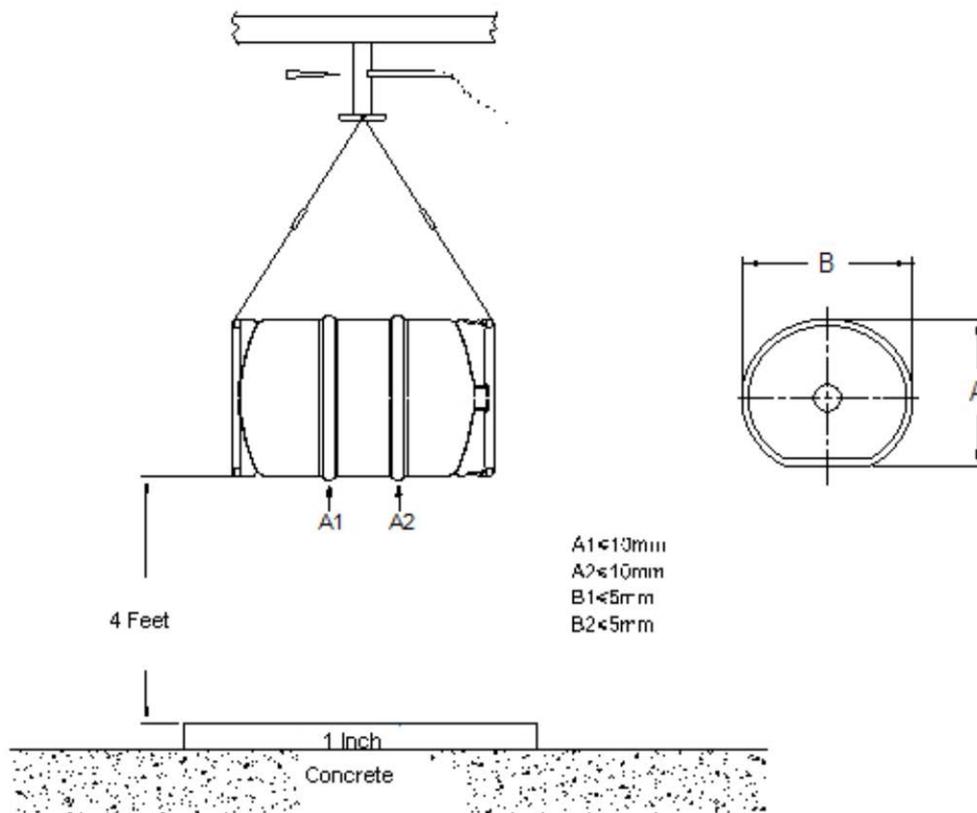
1. Fill keg completely with water and pressurise to 1.03 Barg (15 Psig) - at least 99.5% full
2. Measure the following. (See diagram below):
 - a. Outer diameter of each chimb (or as appropriate) at A1 and A2 (See diagram)
 - b. 90° from first measurement at A1 and A2 - outside diameter
3. Lift filled keg to a height of 1.2 meters
4. Tilt keg to an angle of 90° from floor
5. Utilising a release mechanism, drop keg onto steel plate on keg side
6. Re-measure the following locations on the keg:
 - a. Point of impact – outside diameter A1 and A2
 - b. Perpendicular to point of impact at A1 and A2 - outside diameter
7. Repeat drop two (2) additional times for a total of three (3) drops for this test
8. Measure after every drop.

Passing criteria for Test:

Any change in measurement must meet the following to be deemed a success for test 1:

- Measurement a is less than 10mm
- Measurement b is less than 5mm
- No bursting and no leakage

Summary: Summarise the test results and finalise the report.



2.2.3. NECK DEFLECTION (REFILLABLE KEGS ONLY)

Containers should demonstrate compliance to the following test criteria:

Both static and dynamic testing of the kegs is carried out on a purpose built test rig.

3.1 Lateral — static.

An inflexible bar, at least 1000 mm long and with a fitting to locate positively in the neck of a keg, shall be attached to the neck whilst the keg is held immovably in the horizontal position.

A 25 kg load shall be placed on the bar at a distance of 100 mm from the neck of the keg, left there for a minimum of two seconds and then moved a further 100 mm away from the keg neck for a further two seconds and so on.

After its removal from a position 1000 mm from the keg neck, the deflection of the bar at the 1000 mm marker shall not exceed 20 mm from its position before the load was applied.

3.2 Lateral — dynamic.

The test arrangement is as in 3.1 above.

A 10 kg load shall be dropped onto the bar at a point 300 mm from the neck and from a height of 350 mm.

The total deflection at the 1000 mm marker when the load is dropped and the permanent set after the load has been removed shall both be measured. The latter shall not exceed 30 mm.

3.3 **Axial.**

A gradually-increasing load shall be applied vertically downwards onto the centre of the neck. This is normally achieved by using a hydraulic pump and ram on a beam with the resultant reaction being taken by the top chimb hand holes.

The top dome must withstand a force of 9.5KN with no permanent deformation when the load is removed.

SINGLE USE KEGS:

2.2.4 KEG DROP/IMPACT TEST METHOD

Scope: The purpose of this document is to provide guidance on drop/impact testing on pressurised beer kegs in their final packaging format. This guide is for kegs 15L to 50L.

Purpose: Determine if the keg is fit for use.

Material Components Required for Testing:

1. Test Kegs and corresponding components
2. Water
3. Thermometer
4. Valve
5. Measuring Device (i.e. tape measure and ruler/caliper)
6. Pressure Gauge
7. Lifting / Tilting apparatus (i.e. a sling)
8. Dropping Surface: 1 inch thick steel plate on concrete

Procedure:

Test 1: Top of keg body on hand hole drop

1. Fill keg completely with 4.4° C (40°F) water and pressurise to 1.03 Barg (15 Psig) - at least 99.5% full
2. Lift filled keg to a height of 4 feet (1.2 meters)
3. Tilt keg to an angle of (45°/50°)
4. Utilising a release mechanism, drop keg onto steel plate on the top of keg body on hand hole

Passing criteria for Test 1:

No bursting and no leakage, and functionality of the container for safe handling and dispensing remain unaffected.

Test 2: Perpendicular to hand hole drop

1. Fill keg completely with 4.4°C (40°F) water and pressurise to 1.03 Barg (15 Psig) - at least 99.5% full
2. Lift filled keg to a height of 4 feet (1.2 meters)
3. Tilt keg to an angle of (45°/50°)
4. Utilising a release mechanism, drop keg onto steel plate at a location perpendicular to hand hole

Passing criteria for Test 2:

No bursting and no leakage, and functionality of the container for safe handling and dispensing remain unaffected.

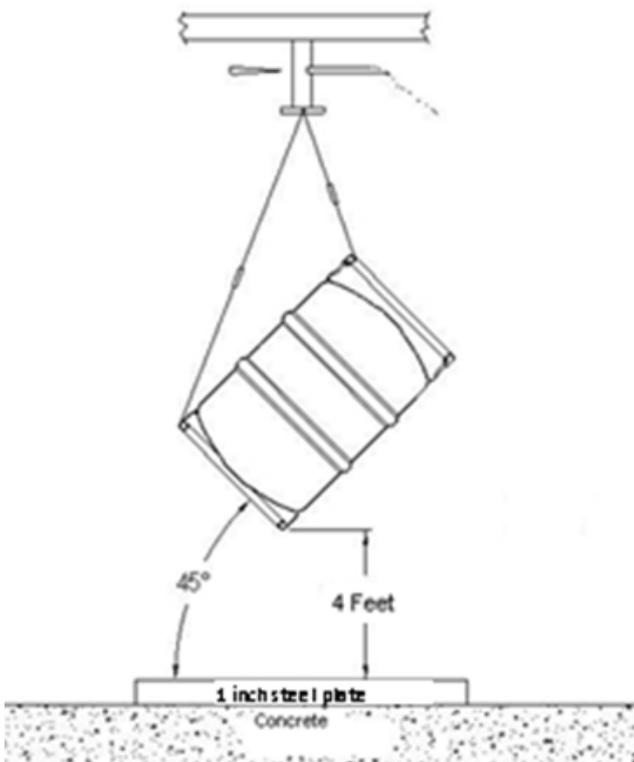
Test 3: Bottom keg body/butt weld drop

1. Fill keg completely with 4.4° C (40°F) water and pressurise to 1.03 Barg (15 Psig) at least 99.5% full
2. Lift filled keg to a height of 4 feet (1.2 meters)
3. Tilt keg to an angle of (45°/50°)
4. Utilising a release mechanism, drop keg onto steel plate at a location perpendicular to hand hole

Passing criteria for Test 3:

No bursting and no leakage, and functionality of the container for safe handling and dispensing remain unaffected.

Summary: Summarise the test results and finalise the report.



2.2.5 KEG HORIZONTAL DROP/IMPACT TEST METHOD

Scope: The purpose of this document is to provide guidance on drop/impact testing on pressurised beer kegs.

(This guide is for kegs 15L to 50L. This test method does not address all of the safety concerns. It is the responsibility of the user of this method to establish appropriate safety practices.)

Purpose: Determine if the keg is fit for use.

Material Components Required for Testing:

1. Test Keg and corresponding components
2. Water
3. Thermometer
4. Valve
5. Measuring Device (i.e. tape measure and ruler/caliper)
6. Pressure Gauge
7. Lifting / Tilting apparatus (i.e. a sling)
8. Dropping Surface: 1 inch thick steel plate on concrete

Procedure:

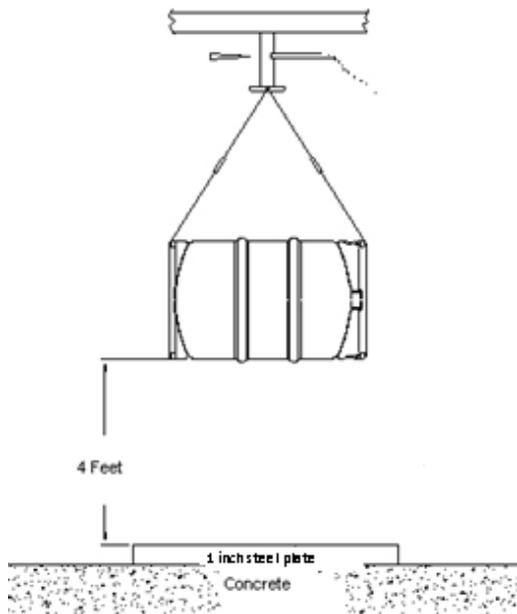
Test: Horizontal Keg body Impact Drop

1. Fill keg completely with 4.4°C (40°F) water and pressurise to 1.03 Barg (15 Psig) - at least 99.5% full
2. Lift filled keg to a height of 4 feet (1.2 meters)
3. Tilt keg to an angle of 90° from floor
4. Utilising a release mechanism, drop keg onto steel plate on keg side

Passing criteria for Test:

No bursting and no leakage, and functionality of the container for safe handling and dispensing remain unaffected.

Summary: Summarise the test results and finalise the report.



2.2.6 PRESSURE TESTING

Proof Pressure testing

Scope: Proof pressure testing of keg or venting device and testing of keg resistance to permanent deformation due to pressurisation.

(This test method does not address all of the safety concerns associated with this test. It is the responsibility of the user of this method to establish appropriate safety practices.)

Purpose: Determine if the keg or venting device is fit for use regarding pressure resistance.

Material Components Required for Testing:

1. Complete manufactured keg
2. Valve or quick connect
3. Clean, oil free plant air
4. Measuring Device (i.e. tape measure, ruler/calliper, go/no go gauge)
5. Pressure Gauge
6. Timing Device (i.e. clock or stop watch)

Procedure:

1. Measure keg liquid volume
2. Apply pressure to keg and bring to Proof Pressure 6.2 Barg (90 Psig) or until venting device activates and hold for 30 seconds
3. Relieve the pressure
4. Re-measure keg diameters and heights
5. Record data
6. Analyse test results
7. Finalise test report

Passing criteria for Test:

Kegs must be capable of holding a minimum internal pressure of Proof Pressure 6.2 Barg (90 Psig) without leaking or permanent deformation OR pressure venting device must activate according to manufacturer's specification.

Summary: Summarise the test results and finalise the report.

2.2.7 Pressurisation to Failure

Scope: Pressurisation to failure performance of keg during manufacture stage.

(This test method does not address all of the safety concerns. It is the responsibility of the user of this method to establish appropriate safety practices.)

Purpose: To verify that the keg design can fail safely (see section 1.5 above) upon rupture with no fragmentation.

Material Components Required:

1. Test Kegs without a pressure relief device and corresponding components.
2. Water
3. Thermometer
4. Valve
5. Hydraulic Pump
6. Measuring Device (i.e. tape measure and ruler/calliper)
7. Pressure Gauge
8. Timing Device (i.e. clock, stop watch, etc.)

Procedure:

1. Conduct the following test on kegs without pressure relief devices
2. Fill keg completely with water
3. Allow the water to come up to the ambient temperature of the test cell
4. Fit valve and connect hydraulic pump
5. Increase pressure gradually until keg ruptures
6. Record date, time, temperature, and rupture pressure
7. Analyse test results
8. Finalise test report

Passing criteria for Test:

Kegs must fail safely (see section 1.5 above) with no fragmentation at rupture or vent pressure.

Summary: Summarise the test results and finalise the report.

GENERIC PURCHASING STANDARD

PLASTIC KEG

REFILLABLE / SINGLE USE

WITHIN THE FOOD & BEVERAGE INDUSTRY

1 General

- 1.1 Supply must comply with the requirements of the required design specification, including identified and authorised technical drawings, which shall either be issued by [Customer] or produced by the manufacturer in response to dimensional and other constraints stipulated by [Customer] (see Appendix 1) and signed by [Customer's] nominated representative.
- 1.2 No major changes in materials or design specifications shall be made without written approval of the authorised representative of the purchaser. Defined, minor changes may only require notification and new drawings issued, without prior approval.
- 1.3 Plastic keg properties differ significantly to those of traditional materials. The purchaser must work closely with the supplier to ensure compatibility at all stages of the cleaning, filling, supply chain, dispense, maintenance and other relevant processes.
- 1.4 End of Life – single use kegs must be disposed of/recycled according to national Waste Framework Directive requirements (Directive 85/339/EEC Packaging & Packaging Waste)

2 Legislation

- 2.1 All manufacturers must adopt Good Manufacturing Practice according to EC Regulation 2023/2006. Particular attention is drawn to Articles 1, 3 and 5.
- 2.2 All product-contact materials must comply with the Framework Directive (EC 1935/2004; The *'Materials and Articles intended to come into contact with Food'* Regulation). Particular attention is drawn to Articles 3, 15, 16 and 17.
- 2.3 All product-contact surfaces must comply with Article 2 of the Food Hygiene Regulations (EC 852/2004). Particular attention is drawn to Article 2 and Chapters II and V.

3 Ownership identification and colour banding (Refillable Kegs)

- 3.1 [Customer's] ownership identification (name) shall be applied to each container in the format detailed in [Customer's] Design Standard.
- 3.2 A purpose designed section shall be incorporated within each container in the format detailed in [Customer's] Design Standard and/or applied by the Customer. Written confirmation of [Customer's] entitlement to specify this colour-banding will be submitted to the container manufacturer.

4 Container Numbering (Refillable Kegs and Single Use Kegs)

- 4.1 In the format detailed in the [Customer's] Design Standard, a unique and permanent serial number (batch code, in the case of Single Use Kegs) shall be applied to each container.
- 4.2 **Refillable Kegs** - the serial numbers to be used for each production run will be specified on [Customer's] Purchase Order/Instructions.

- 4.3 Lists of serial numbers (batch codes, in the case of Single Use Kegs) used shall be sent to [Customer] as agreed. These lists will identify the technical drawings to which the containers were made.
- 4.4 The keg manufacturer shall keep copies of these data for a period of time, as agreed by the supplier.

5 Keg necks and extractor tubes (spears)

- 5.1 Refillable Kegs - only extractor tubes (spears) to a specification approved in writing by [Customer] may be used and they must be fitted in accordance with extractor tube manufacturer's instructions.
- 5.2 Single Use Kegs – dispensing systems are typically bespoke to the design of the keg and there is a need to ensure compatibility via dialogue with the manufacturer.
- 5.3 Storage of the synthetic components of extractor tubes awaiting use at the keg manufacturer's premises must be in accordance with the recommendations of the manufacturer of those components and must, in particular, avoid exposure to direct sunlight, cold temperatures (ice) and/or ozone-producing conditions.

6 Quality Assurance and Quality Control

- 6.1 [Customer] encourages every manufacturer to operate a "right first time" policy and to seek ISO 9001 accreditation. Reworked containers shall therefore be identified as such with a durable sign on the container. Full details of each re-worked container shall be documented for [Customer].
- 6.2 [Customer] (or his appointed, qualified nominee) reserves the right to inspect production of the manufacturing process and premises. according to the established ISO 9001 audit procedure.
- 6.3 In discussion with the manufacturer, the [Customer] (or his appointed, qualified nominee) reserves the right to request an inspection [Customer] undertakes to respect the confidentiality of this information. Supplier reserves the right to protect intellectual property.

7 Guarantees/Warranty

- 7.1 **Refillable Kegs** - there shall be provided a written guarantee/warranty by the container manufacturer against faulty materials and manufacturing processes as specified by the manufacturer. (This applies to the container and its neck only; not to the extractor tubes supplied to him.)
- 7.2 The appropriate Indemnity Certificate shall be issued with each manufacturing batch.
- 7.3 A list of manufacturers and suppliers who have lodged their records with the BFBi may be accessed via +44 (0)1902 422303.

APPENDIX

Participating Manufacturers & Suppliers:

DOLIUM®-One-Way PET Kegs

Belgium

Tel: +32 471 133 132

Email: info@dolium.eu

Website: www.dolium.eu

Emerald

Ireland

Tel: +353 (0)91 770 819

Email: info@emerald.com

Website: www.emerald.com

Kegspertise Ltd

UK

Tel: +44 (0)1274 851464

Email: andy.dorr@kegspertise.com

Website: www.kegspertise.com

Lightweight Containers B.V.

Netherlands

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Website: www.keykeg.com

Petainer UK Holdings Ltd

UK

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Website: www.petainer.com

Polykeg srl

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Email: vmoore@polykeg.co.uk

Website: www.polykeg.it