



British Glass
Manufacturers' Confederation

**STRENGTH AND PERFORMANCE STANDARDS
FOR THE MANUFACTURE AND USE OF
CARBONATED BEVERAGE BOTTLES**

TEC 7

British Glass

9 Churchill Way

Sheffield

S35 2PY

Tel: 0114 290 1850

Fax: 0114 290 1851

Web: www.britglass.org.uk

This booklet was originally published by the Glass Manufacturers' Federation. It is now published by the British Glass Manufacturers' Confederation, which is an organisation formed on 1 July 1988 by the amalgamation of the Glass Manufacturers' Federation and the British Glass Industry Research Association.

First published April 1978 (by the Glass Manufacturers' Federation)

Revised edition March 1979 (by the Glass Manufacturers' Federation)

Revised edition 1985 (by the Glass Manufacturers' Federation)

Revised edition April 1989 (published by British Glass)

Revised edition August 1994

Revised Edition June 2001

Reprinted October 2001

Revised August 2010

Revised (layout changes only) March 2011

**STRENGTH & PERFORMANCE STANDARDS
FOR THE MANUFACTURE AND USE OF CARBONATED BEVERAGE BOTTLES**

TEC 7

INDEX

	<u>Page</u>
<u>INTRODUCTION</u>	1
<u>PART ONE</u> <u>DEFINITION OF PRINCIPAL TERMS USED</u>	2
<u>PART TWO</u> <u>CONTROLS BY THE GLASS MANUFACTURER</u>	4
2. GENERAL	4
2.1 Inspection	5
2.2 Surface Treatment	6
2.3 Annealing	6
2.4 Re-test Procedures	6
2.5 Strength Tests	6
2.6 Glass Weight and Capacity	10
2.7 Dimensional Standards	11
2.8 Minimum Glass Thickness	14
2.9 Bottle Design and Specification Drawings	16
2.10 Design Headspace	17
2.11 Record Keeping	19
<u>PART THREE</u> <u>GUIDELINES FOR THE USE OF CARBONATED BEVERAGE BOTTLES BY BOTTLERS, DISTRIBUTORS RETAILERS AND CONSUMERS</u>	
3. GENERAL	20
3.1 Handling and Unloading	20
3.2 Unscrambling	21
3.3 Bottle Cleaning (water or air)	21
3.4 Filling, Capping and Labelling	21
3.5 Conveyor Systems	22
3.6 Heat Treatment	23
3.7 Packing and Distribution of Filled Bottles	23
3.8 Operator Safety	24
3.9 Retailer Considerations for Use	24
3.10 Consumer Considerations for Use	25

This page has been deliberately left blank.

INTRODUCTION

TEC 7 gives guidance to bottlers, packers, merchants and users of glass containers for carbonated beverages, in the broadest sense.

Part 1 explains the principal and technical terms used in glass container manufacture, in filling and packing operations.

Part 2 contains a Code of Practice which has been established for manufactures of glass containers with a view to ensuring that an acceptable quality of bottles for carbonated products is maintained.

Part 3 describes precautions and recommendations for fillers, packers, retailers and others who supply and use the filled containers.

Although the contents are in no way mandatory, the aim of the booklet is to give guidance to all concerned regarding the manufacture and use of carbonated beverage bottles made by conventional techniques and covering the normal methods of bottling and distribution. If it is intended to depart from normal practice, either in container design or manufacture, or in filling, packaging, distribution or marketing, then any necessary additional control and precautions must be discussed between the parties involved.

Glass bottles of a nominal capacity of greater than 1.15 litre (1150 ml) are not recommended for packaging carbonated soft drinks or carbonated water. Glass bottles are not recommended for packaging soft drinks where carbonation pressures exceed 4.7 bars, except in the case of refillable bottles with a nominal capacity no greater than 180 ml, where carbonation pressure up to 5.3 bars may be used.

The document also addresses the responsibility of glass manufacturers regarding legislation such as the Health and Safety at Work Act 1974 and the Consumer Protection Act 1987. The Consumer Protection Act 1987 provides that a product is defective when its safety is not such as persons are generally entitled to expect. When deciding whether a product is defective, the way in which the product is marketed, the instructions and warnings accompanying it, and what might reasonably be expected to be done with it. It is for this reason that all refillable bottles designed since March 1988 have indicated, either by words or signs, that they are refillable and users of glass containers are recommended to consider incorporating words such as “do not re-use” on labels of all non-refillable containers. This is to try and prevent misuse of such containers for purposes for which they were not designed. In the case of carbonated beverages in particular, British Glass recommends that all packages for carbonated products, whether they be metal, plastic or glass, should carry a guidance note to advise the retailer and consumer that the contents of the package are pressurised and should be handled with care.

PART ONE

DEFINITIONS OF PRINCIPAL TERMS USED

Annealing – The slow and controlled cooling of bottles so that thermal stresses and strains within the bottles are gradually relieved. The amount of residual stress, known as the temper, is assessed by optical comparison with a number of standard strain discs.

Bi-directional accumulator table – A wide, mechanically driven conveyor at right angles to the flow of bottles. A trip switch sets the conveyor in reverse motion to take off an overflow of bottles. Similarly, a second switch sets the conveyor in forward motion to feed bottles back onto the line when it starts to run empty.

Cage pallets – Rigid rectangular containers of wire mesh, sometimes used for the transport and retail self-service of filled bottles. (Cage pallets are not recommended because damage may be caused to the glass and safety may be prejudiced).

Carbonation level – The carbonation level is the number of volumes of CO₂ gas dissolved in one volume of liquid, measured under equilibrium conditions. Alternatively, it can be expressed in grams of CO₂ per litre.

Carbonated beverage – This is a beverage where the carbonation level exceeds 1 vol CO₂.

Change parts – Machine parts such as worm feeds, starwheels, guides etc. that are changed to cater for different bottle sizes.

Dead plates – Flat sheets, usually metal, bridging gaps between conveyors or between conveyor and machine.

Drop-end tray – Open top tray with ends folded in such a way that they can be opened and the bottles pushed out.

Headspace – The space within a bottle designated to be left unfilled and expressed in ml.

Imperfection – A bottle which departs from the normally accepted commercial quality.

Internal pressure resistance – This is the amount of internal pressure which the bottle can withstand without breaking when tested hydraulically under the conditions stated in 2.5.2.

Internal pressure generated by the product – This is the pressure generated by the beverage at 20°C.

Line dividers – Guide rails or mechanism diverting bottles into different conveyor lines.

Mechanical strength – The resistance of the bottle to external forces is assessed in two ways:

Vertical load strength – The load which the bottle can withstand when tested under conditions tested in 2.5.3.1.

Impact strength – The stresses produced by impact can effectively be simulated in a dynamic test in which the bottle is squeezed between a pair of rollers pressed together with a known force, as described in 2.5.3.2. For example, if stress simulation is specified, all bottles with cylindrical bodies should be tested in this way. Alternatively off-line testing can be carried out using a Pendulum Impact Tester as part of the routine quality schedule. This latter procedure is normally only carried out at the design and sampling stage of production unless a problem with line breakage has been detected. AGR supply impact testing equipment of this type which is widely used throughout the industry.

Minimum test values – The minimum test value specifies the non-conformance level below which re-sampling or corrective action is instituted immediately to reverse a trend towards substandard bottles.

Mould cavity number – The mould cavity number is the code number, usually on the bottom or lower sidewall of the bottle, which enables a particular bottle to be identified with the individual blow mould from which the bottle is produced.

“Round” of bottles – A “round” of bottles represents one bottle from each mould cavity on the glass forming machine.

Shift – A shift is the continuous period of time during which an operator or tester is at work.

Splits - A fracture, greater than 6 mm in length, which penetrates more than a quarter of the way through the glass.

Substandard test level – A standard below which the bottle may not perform satisfactorily.

Surface treatment – This is a coating, or more usually a combination of coatings, applied during manufacture, sprayed onto the bottles or applied as a vapour through which the bottles have to pass. Its function is to assist in maintaining the mechanical strength of the bottle by reducing friction and therefore abrasion during handling. There are several coatings available and the choice will depend on the service conditions of the bottles and the extent of protection needed.

Test frequency – The frequency needed for each test depends on the type of test itself, prior knowledge of the likely rate of variation of the property being measured, and up-to-date knowledge of how the property is actually varying at the time. It is normal and good practice to increase the frequency when unusual variation is being encountered and to decrease it again when the test measurements have been running steadily for some time. Indications are given in 2.5 as to the test frequencies which are generally found effective.

Thermal shock resistance – This is the sudden temperature change which a bottle can withstand without breaking when tested under the conditions stated in 2.5.1.

Unscrambler table – Moving slat conveyors or a large rotating disc forming a table from which bottles are automatically led onto the filling line.

Vacuity – The headspace (see definition of ‘headspace’, page 3) expressed as a percentage of the nominal value.