DoE PROJECT 10B
WATER ECONOMY

Report 11727/6

October 1995

Prepared for:

Department of the Environment

Compiled by:

R G Brown
P R Crampton
S Champion

No of pages: 1 of preamble
7 of text

© This document is Crown copyright
CONTENTS

1. INTRODUCTION .................................................................................................................. 1
2. WORLD SITUATION REVIEW ............................................................................................. 1
3. WC FLUSHING REQUIREMENTS IN OTHER COUNTRIES .................................................. 3
4. PRODUCT SOURCING AND LABORATORY EVALUATION .................................................. 4
5. IMPORT / EXPORT STUDY ................................................................................................. 5
1. INTRODUCTION

This report consists of a compilation of the summaries of the five technical reports which were produced by BSRIA on behalf of DWI as part of DoE Project 10B - Water Economy. The research was undertaken in advance of changes to the Water Bylaws and the aims were:

- to establish whether or not in the light of European and International technical developments there is any significant case for the UK to maintain its current requirements relating to the water efficiency of WCs ie the requirement for valveless siphonic flushing as per Bylaw 74(a);

- to make a study of the likely effects on UK imports and exports involved if current requirements are relaxed;

- to advise on the implications for increased competitiveness in domestic and international markets.

The broad approach to be adopted for the study was specified in the invitation to tender and developed in consultation between BSRIA and DWI.

2. WORLD SITUATION REVIEW

Report 11727/1 contains the results of a worldwide survey of WCs being currently installed with the emphasis on Europe, North America and Australasia including illustrative diagrams of the main types.

There are many different types and designs of WC being installed around the world. These include models made of different materials, including for example stainless steel, and models with various flushing systems, some using little or no water.

The most important types are however water flushed vitreous china models. The most common flushing arrangement is for flushing water to be supplied from a cistern or tank, normally using the force of gravity. WCs are produced in different arrangements depending on consumer preferences / traditions in particular countries. The main types of arrangement are:

- close coupled arrangements with the cistern mounted on the pan;

- separate pans for use with separate or concealed cisterns or flushing valves;

and,

- one piece toilets where the cistern is part of the same piece of china.
There are two main approaches to WC pan design:

the wash down pattern, most common in Europe and areas of European influence, where the flushing water washes the bowl contents over a dam into the trap and;

the syphonic pattern, used in North America and areas of American influence, where flushing is assisted by the creation of a siphon between the sump of the bowl and the trap.

The volume of water used for flushing has reduced in many countries over the past 10 years or so with greater attention being paid to water conservation. A 6 litre flush volume is becoming the norm in many European countries and is the maximum allowed for most installations in the USA and most of Australia and New Zealand.

The outlet from a cistern or tank, providing flushing water by gravity, is normally through a valve - a simple flap (or flapper) type in the USA and areas of American influence or a more complex drop valve in Europe and Australasia. The valveless siphon required in the UK is found in few other countries.

Pressurised flushing valves, often connected to the mains, are used in many countries, particularly for public toilets.

In North America a popular design uses mains water pressure to compress air which is then used to provide a "pressure assisted" flush.

Interruptible flush, which can provide a shorter flush where there are no solids, is common in a number of European countries. Dual flush is also available in some European countries and a two button dual flush mechanism has become the norm in Australia and New Zealand.

The performance of various designs which achieve a 6 litre flush volume will clearly be of interest. It will also be necessary to assess the reliability and tendency to water leakage of the flushing mechanisms used with these designs.

Product now being installed in Australia and New Zealand may be of particular interest because WC pan designs have been developed from those of British manufacturers.
3. **WC FLUSHING REQUIREMENTS IN OTHER COUNTRIES**

Report 11727/2 compares the performance tests required of WCs and flushing devices in various countries around the world. Installation and maintenance requirements, including qualifications of personnel, are also reviewed.

An overview of attitudes to water conservation and regulatory systems applicable to plumbing installations is provided.

Eleven countries were considered in the survey, extending to North America, Japan and Australasia and including six leading countries in the European Union.

General attitudes to water conservation vary between countries but awareness of water use is likely to be influenced by measurement of individual supplies. In all the countries surveyed water meters were either universally used or installed in the majority of residential buildings. This compares with a water meter penetration of just over 5% amongst households in the UK. It can be argued that charging for a measured supply of water gives greater encouragement for householders to rectify leaks or install water conserving equipment.

The structure of regulations affecting plumbing installations varies between countries, but in most countries requirements are ultimately set and enforced at local level, based on national model regulations and standards. In Germany and the Netherlands as well as most parts of the USA, Canada and Australia standards and codes of practice are regulatory documents, enforced by regional or local government or water undertakings.

In most countries WCs and flushing devices are required to meet relevant standards or other criteria. In Germany, the Netherlands, Canada and Australia an approval mark issued by a particular certifying body is required.

Installation requirements for WCs are set out in regulations or in "deemed to satisfy" guidance. In most countries the installation must be carried out by a qualified and registered plumber.

Specific requirements for regular maintenance of WC systems and their components were only found in a few countries. In general, enforcement of any requirements, particularly amongst privately owned single family dwellings, is likely to be limited to response to defects affecting neighbours or the supply main.

Table 1 in Report 11727/2 gives an overview of the test requirements for WC pans in eight of the countries surveyed with requirements of the current British Standards and the draft European Standard included for comparison purposes.
4. PRODUCT SOURCING AND LABORATORY EVALUATION

Report 11727/3 describes the initial phase of product selection and sourcing based on Report 11727/1. Representative products were obtained from the UK, Italy, Germany, Switzerland, France, Sweden, Slovenia, Australia and the USA. Report 11727/4 then describes the results of the laboratory tests of flushing performance and endurance of those products.

The flushing performance tests were based on current UK standards, US standards and proposed CEN standards to provide a broad comparison between UK and non-UK products. The endurance tests were designed to investigate the long term leakage potential of the various products.

The flushing performance of the fifteen non-UK ie non-siphonic flushing products, assessed over a variety of tests based on current UK and other national standards, was found to be as good or better that the three 7.5 litre UK products used as the benchmark. The cheaper products generally performed as well as the more expensive ones.

Endurance testing of eight flush valve products under laboratory conditions suggested that while they would all eventually leak (after 100,000 cycles or more equivalent to 10 yrs typical domestic use) the leakage rates would initially be small ie equivalent to less than one flush per week. The key determinant of water wastage would be whether the user initiated remedial maintenance within a reasonable period of time after first detecting the leakage. The same consideration would apply to leaking inlet valves, whether on siphon or valve cisterns. This test did not however simulate ageing of the flush valve seals which may be a factor in their long term performance. In most cases, seals can easily be replaced by the user without the use of tools.

Four of the tested drop valves were subject to sticking which caused serious short term leakage but in actual installations this would have been very evident to the users who would have initiated rapid remedial action, particularly if water metered. In two cases the problem was permanently corrected by minor adjustments, emphasising the importance of correct installation. In the other two cases the valve mechanism was replaced.

Overall, there is no evidence from this research that allowing the use of non-siphonic products, tested to proposed European standards and correctly installed, in the UK would have a significant adverse effect on water conservation. The small amount of leakage that ultimately occurs would almost certainly be compensated by the better performance of valved cisterns at low flush volumes.

It is however recommended that prior to the establishment of suitable standards acceptable to the UK, non-siphonic cisterns be permitted only where there is water metering to ensure there is a financial incentive to quickly deal with any serious leakage that may occur.
5. IMPORT / EXPORT STUDY

Report 11727/5 describes the results of a programme of twenty four personal interviews and three telephone interviews, carried out with key personnel in different sectors of the UK sanitary ware industry, to assess the potential impact on the industry of relaxing regulatory requirements.

Two main issues emerged which centred around reduction of flushing volumes and the introduction of discharge valves.

It was generally agreed that prospective changes to regulatory requirements from those in the byelaws would open up the UK market for foreign importers, especially of products with push button discharge valves. However the extent to which this would be so varied with the type of respondent. Thus, manufacturers considered that the market would be "flooded with cheap imports," whereas distributors and importers tended to see the change as more a continuous trickle rather than a flood. In fact it appears that products from abroad are already entering the WC market and will continue to do so, despite our "local" product differences, such as the prohibition of the discharge valve.

Most of the bathroom industry report that they are in any case currently experiencing great difficulties achieving reasonable profits, fighting, as they are, a continuous price battle. BSRIA's conclusions are that it will therefore be better for the industry to make a change sooner and with good warning, while the opportunities still exist to compete successfully at home and overseas, rather than to leave it too late. Thus, although manufacturers claim that prospective changes to regulatory requirements would result in significant commercial costs for them (which appear to be the main grounds for objecting to them), alternative marketing strategies could turn these perceived threats from abroad into opportunities. This is so especially given that excluding foreign products, through regulation, is by no means guaranteed to halt the threat, but is likely only to slow it down somewhat.

Reduction of flushing volumes would seem to incur rather more costs on the part of the manufacturers than would allowing discharge valves into the UK. Pans need to be redesigned and manufactured better, in order to flush effectively with siphons at lower volumes. BSRIA however believes it is possible to do so, judging from experience of foreign products flushing on less water. However there is evidence that the major UK suppliers are still working on getting their 7½ litre designs right and, while they remain less than adequate, more water is often used as systems are flushed twice.

Because of the costs to manufacturers in redesigning pans and seats (which is more costly than redesigning cisterns for discharge valves), BSRIA recommends that the DoE communicate any final required maximum volume at the outset, of any changes revised, rather than introducing reductions piece meal, where possible. It would minimise the costs of any redesign work, if changes can be made all at once.
Possible suggestions for DoE to adopt when making changes to the regulatory requirements are:

- to stipulate a requirement for an external overflow outlet with any permitted discharge valves, in order to make any leaking obvious
- to permit installation of discharge valves only in properties which are water metered
- to implement any requirements for reduced flushing volumes in one step rather than in gradual steps
- to encourage European harmonisation of testing standards and regulatory requirements
- to provide sufficient notice to all industry sectors so they can adjust as necessary. BSRIA believes a transition period of three to four years would be necessary. In which case, although it would be clumsy, legislation would have to continue enforcing the existing byelaws for a period.